Environmental Assessment

Flamingo Wastewater System Improvements
Everglades National Park

Monroe County, Florida

Prepared for

United States Department of the Interior
National Park Service

Prepared by

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On the Cover: Greater Flamingo (*Phoenicopterus ruber*), ©2002 Roy Wood. After the half dozen or so families living "down on the Cape" successfully applied for a U.S. Post Office, they were faced with the task of coming up with a name for their town. Though some preferred "Mosquito," everyone eventually agreed to honor the place with the name of its most distinctive resident, the flamingo. Over one hundred years later, with perseverance and a lot of luck, flamingoes can still be found in the vicinity of Flamingo.

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Flamingo Wastewater System Improvements

EVERGLADES NATIONAL PARK
MONROE COUNTY, FLORIDA

Summary

The Flamingo wastewater treatment plant is located within the largest mangrove ecosystem in the Western Hemisphere. The wastewater treatment plant discharges into a manmade percolation pond (Eco Pond), consequently the effluent quality has the potential to directly impact the surrounding wetland environment.

The wastewater plant and collection system, serving the Flamingo developed area, are operational but in poor condition. A one million gallon lined lagoon serves as an emergency holding area (2-week holding capacity) for raw sewage during periods when the wastewater plant is off line.

The effluent from the wastewater treatment plant has been unable to consistently meet the currently permitted maximum effluent discharge standard of *12 parts per million* for nitrate. Regular groundwater monitoring adjacent to Eco Pond, however, has consistently given results well below the groundwater limit of *10 parts per million* for nitrate. Given these test results, the wastewater treatment plant has remained in compliance with the plant's operating permit and current state regulations. Effluent discharge standards will become more stringent in 2010, requiring a total nitrogen limit of *10 parts per million*, and a total phosphorous limit of *1 part per million* in plant effluent. Potential impacts to nearby Outstanding Florida Waters may require that plant effluent meet even lower limits to prevent potential degradation of those waters.

The National Park Service has investigated a long-term solution to the problem. The park considered but rejected several alternatives before deciding to evaluate the following preferred alternative to provide an effective, efficient, and reliable wastewater treatment system that meets all federal, state, and local operational and effluent standards in an environmentally sound manner. In doing so, the park would ensure sound stewardship of the surrounding ecosystem.

The preferred alternative consists of upgrading and modifying the existing 90,000 gallon-per-day wastewater treatment plant without expanding the existing developed area; retaining some useful portions of the existing plant, demolishing other portions that cannot be retained, and testing and replacing deteriorated portions of the wastewater collection system. Treated effluent would continue to be discharged into a percolation pond (Eco Pond). A U.S. Environmental Protection Agency (EPA) approved herbicide would continue to be used on a regular basis to remove cattails from Eco Pond.

The upgraded wastewater treatment plant would reduce total nitrogen and phosphorous levels (effluent discharge) to meet or exceed the 2010 Florida Department of Environmental Protection standards.

Other improvements that would occur include meeting EPA Class III reliability standards, and elevating wastewater treatment plant structures and equipment to at least 11 feet above mean sea level to avoid flooding during hurricane events.

Unlike the no action alternative, the preferred alternative would ensure an effective, efficient, and reliable wastewater treatment system that meets all federal, state, and local operational and effluent standards in an environmentally sound manner. The preferred alternative would result in minor to moderate, long-term

beneficial impacts to several resources, including public health and safety, water quality and hydrology, wetlands, wildlife and habitats, and vegetation.

Public Comment

If you wish to comment on the environmental assessment, you may mail comments to the name and address below. This environmental assessment will be on public review for 30 days. Comments may also be submitted by e-mail to EVER_Flamingo_WW@NPS.gov. Please note that names and addresses of people who comment become part of the public record. **If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment.** We will make all submissions from organizations, from businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety.

COMMENTS MUST BE RECEIVED BY FEBRUARY 24, 2003. Please address written comments to:

Superintendent
National Park Service
Everglades National Park
40001 S.R. 9336
Homestead, FL 33034

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PURPOSE AND NEED

The National Park Service (NPS) proposes to improve the wastewater treatment facilities which serve the Flamingo developed area of Everglades National Park for the purpose of bringing the collection, treatment, and disposal system into compliance with federal, state, and local environmental standards and regulations.

This project involves the upgrading and modification of the existing permitted 90,000 gallon-per-day, extended-aeration (primary/secondary) wastewater treatment plant and the associated collection/disposal systems along with continued use of Eco Pond for effluent disposal. Throughout this document, references to "90,000 gallons per day" is meant to refer to a three-month average daily flow. This rehabilitation project would be designed to consistently meet present and future Florida Department of Environmental Protection standards.

The existing wastewater treatment plant has been unable to consistently meet the current permitted effluent discharge limit of 12 parts per million for nitrate. Regular groundwater monitoring adjacent to Eco Pond, however, has consistently given results well below the groundwater limit of 10 parts per million for nitrate. Given the test results, the wastewater treatment plant has remained in compliance with the plant's operating permit and current state regulations.

The Florida Department of Environmental Protection effluent discharge standards will be more stringent in 2010, requiring an allowable total nitrogen limit of 10 parts per million and an allowable total phosphorus limit of 1 part per million in plant effluent. Potential impacts to nearby Outstanding Florida Waters (OFW) may require that the plant effluent meet considerably lower limits to prevent degradation of Florida waters.

An environmental assessment analyzes the preferred action and alternative actions for their impacts on the environment. This environmental assessment has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and regulations of the Council on Environmental Quality (40 *Code of Federal Regulations* 1508.9), and the National Park Service's *Director's Order (DO)#12: Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS 2001a), and the National Historic Preservation Act of 1966 (as amended).

PARK MISSION

On May 30, 1934 Congress passed an act authorizing a park of 2,164,480 acres to be acquired through public and private donation. Everglades National Park was to be "… wilderness where no development … or plan for the entertainment of visitors shall be undertaken which would interfere with the preservation of the unique flora and fauna of the essential primitive natural conditions now prevailing in the area." It took another 10 years, but in 1947 Everglades National Park was established.

The intermingling of plant and animal species from both the tropical and temperate zones, plus the merging of freshwater and saltwater habitats, provide the vast biological diversity that makes Everglades National Park unique. As the first national park established to preserve purely biological resources, the park's significant attributes, features, and resources include (NPS 2000a):

- Qualifies as a World Heritage Site, a Biosphere Reserve, a Wetland of International Importance, and an Outstanding Florida Water
- Supports the largest stand of protected sawgrass prairies in North America

- Serves as a crucial water recharge area for south Florida through the Biscayne aquifer
- Provides sanctuary for 21 threatened and endangered species
- Supports the largest mangrove ecosystem in the Western Hemisphere
- Constitutes the largest designated wilderness in the southeast that provides foraging habitat and breeding grounds for migratory wading birds
- Contains important cultural resources and is the homeland of the Miccosukee Tribe of Indians of Florida
- Functions as an internationally significant estuarine complex in Florida Bay and the park's western coast, providing a major nursery ground that supports sport and commercial fishing
- Comprises the only subtropical reserve on the North American continent, preserving a major ecological transition zone where diverse temperate and tropical species mingle
- Functions as a major corridor and stopover for neo-tropical migrants in the south Florida ecosystem
- Encompasses resources that directly support significant economic activities
- Engenders inspiration for major literary and artistic works
- Offers a place where recreational, educational, and inspirational activities occur in a unique subtropical wilderness

Everglades National Park's mission is accomplished through pursuit of the following goals:

- The preservation of Everglades National Park's resources
- The maintenance of the hydrological conditions, including water quality, quantity, distribution, and timing, within Everglades National Park and the south Florida ecosystem, which are characteristic of the natural ecosystem prior to Euro-American intervention
- Providing for public use and enjoyment and a quality visitor experience at Everglades National Park
- Allowing visitors to Everglades National Park to experience the park's unique subtropical wilderness values
- Assisting the public in understanding and appreciating Everglades National Park and its role in the south Florida ecosystem and providing support in achieving the park's purpose
- Strengthening and preserving natural and cultural resources and enhancing recreational opportunities managed by partners
- Assuring that the Seminole and Miccosukee tribes have the opportunity to exercise their existing tribal rights within Everglades National Park to the extent and in such a manner that they do not conflict with the park purpose

PROJECT BACKGROUND, OTHER PROJECTS AND PLANS, OBJECTIVES, SCOPING, AND VALUE ANALYSIS

Project Background

Flamingo is the largest developed area within Everglades National Park and receives over 150,000 visitors annually

(Figure 1 and Figure 2). The existing wastewater treatment plant (Figure 3) serves the Flamingo developed area, including park offices, housing, maintenance, and commercial operations (marina, restaurant, 100-unit lodge, and 278-site campground). Facilities at Flamingo are shown in the photographs of Appendix D.

The Flamingo wastewater treatment system project was presented to the National Park Service Development Advisory Board on July 24, 2001. The project was based on two design analysis reports prepared by the National Park Service – Denver Service Center (February 1997 and August 2000), and the recommendation of a value analysis session held at the park in September 2000 (Appendix I). At the time of the value analysis, it was anticipated that the wastewater plant would need to meet the standards of 10 parts per million for total nitrogen and 1 part per million for total phosphorus.

In late December 2001, the Draft Proposed Rule, FAC 62-302.540, Everglades Protection Area Phosphorus Criterion, was presented by the Florida Department of Environmental Protection Secretary to the State Environmental Regulation Commission. The draft rule restricting phosphorus concentration to 10 parts per billion in surface water "shall apply to all predominantly freshwater portions of the Everglades Protection Area." Since the Flamingo project area is not within the "freshwater portions" of the Everglades Protection Area (documented by surface water chloride levels exceeding 1,500 parts per million and therefore a marine environment), the Everglades Forever Act standards are not considered applicable.

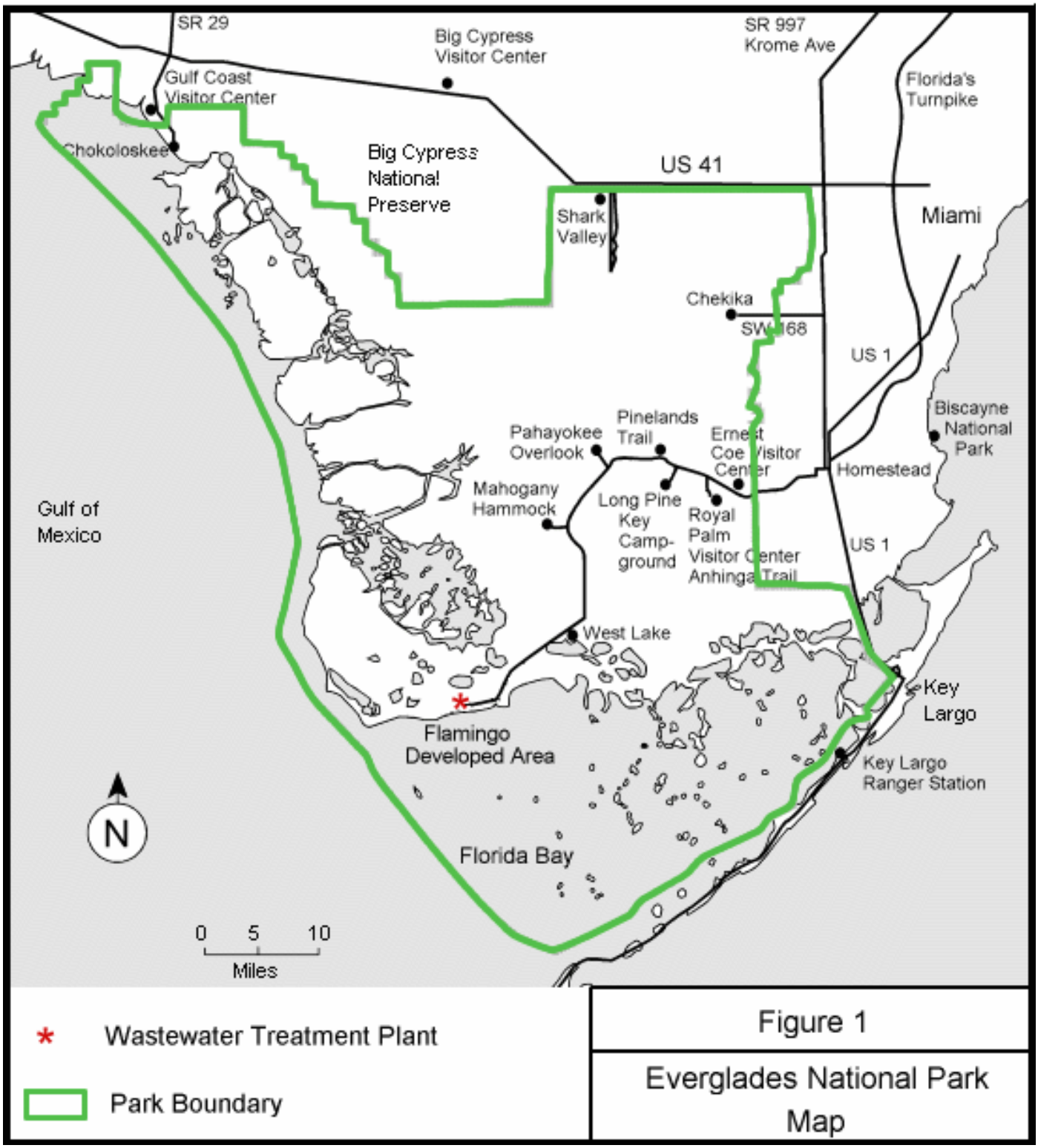
An evaluation of Eco Pond was conducted to determine if the pond functions as an evaporation pond, a percolation (infiltration) pond, or a combination of both. It was determined that evaporation accounts for disposal of 12 to 48 percent of the total volume of water entering Eco Pond. Because there is no surface discharge from Eco Pond (except under hurricane/flood conditions), the remainder of the volume must exit the pond through infiltration into the underlying soils (Jordan, Jones & Goulding 1995).

Existing data show that typical groundwater total phosphorus levels in the Flamingo area range between 0.16-0.80 parts per million, indicating a predictable ambient elevated phosphorus level in the general Flamingo area due to natural marine influences (Jaffé *et al.* 2001).

Estimates of net groundwater percolation from Eco Pond, based on hydraulic head data, hydraulic conductivity estimates, and water quality measurements, suggest that about 50 kg of total phosphorus were released from Eco Pond to the surrounding groundwater during the period from February through July 2000. This amount of phosphorus is subject to transport towards Florida Bay due to the existing north to south groundwater gradient. In this respect, water quality measurements show a decreasing trend in concentration of phosphorus from the wastewater plant effluent and the pond to the groundwater to the marine surface waters. Therefore, Eco Pond is not a significant source of phosphorus to this area of Florida Bay (Jaffé *et al.* 2001).

The requisite quality of plant effluent is subject to potential impacts to the surface waters near the point of discharge at Eco Pond. Such waters are designated as Outstanding Florida Waters. The Outstanding Florida Waters requirements do not allow surface waters to be degraded in any way (nothing may be introduced to surface waters affecting background levels).

The park's consultant, Camp Dresser & McKee (CDM), conducted a "mounding" study and concluded that a relatively minor fraction of effluent flow disposed of at Eco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Gulf Coast Visitor Center
Florida's Turnpike
Chokoloskee
Big Cypress National Preserve
US 41
Shark Valley
Miami
Chekika
SW 168
US 1
Biscayne National Park
Pahayokee Overlook
Pinelands Trail
Ernest Coe Visitor Center
Homestead
Gulf of Mexico
Mahogany Hammock
Long Pine Key Camp-ground
Royal Palm Visitor Center
Anhinga Trail
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Park Boundary
Figure 1
Everglades National Park Map

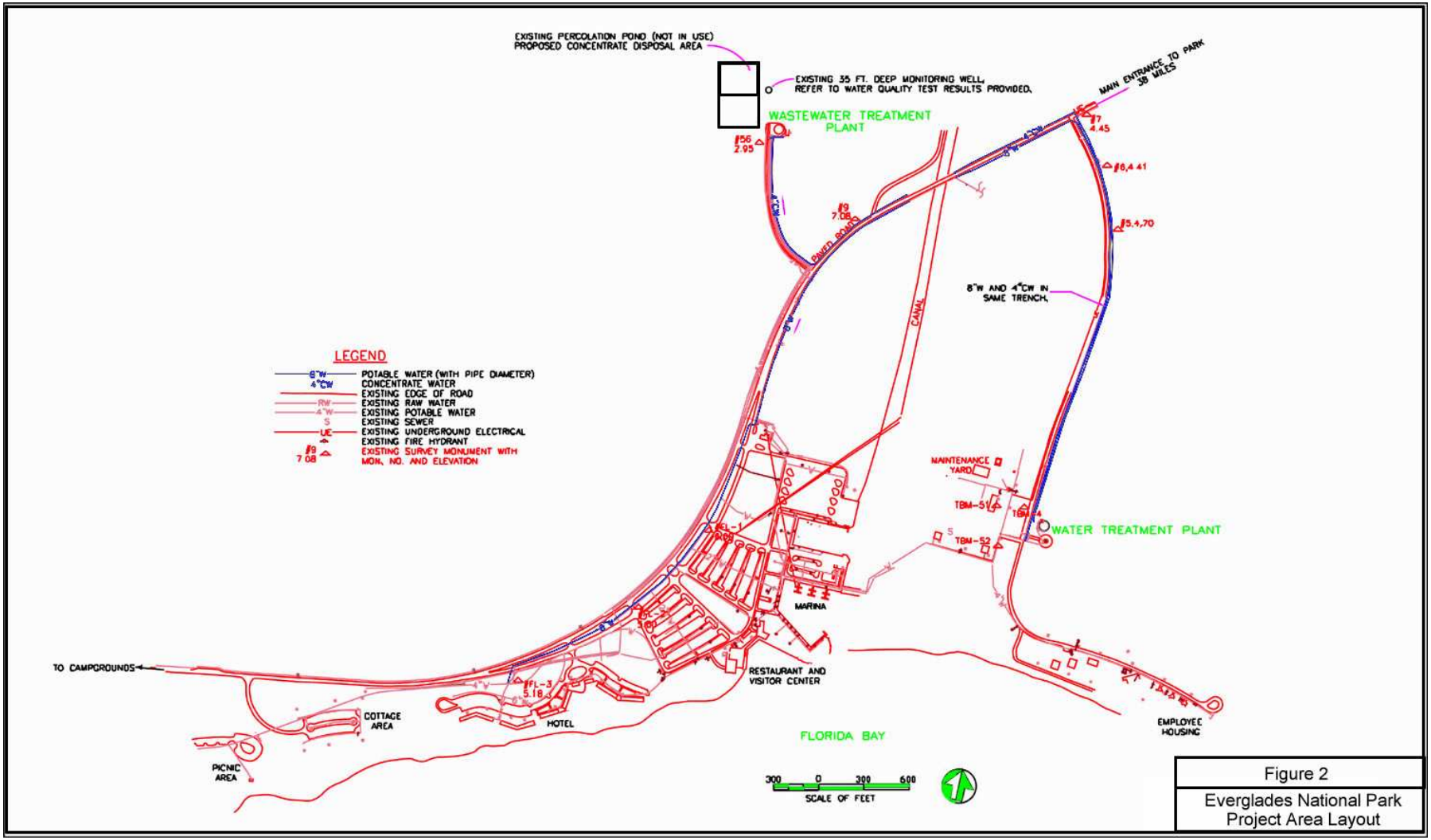
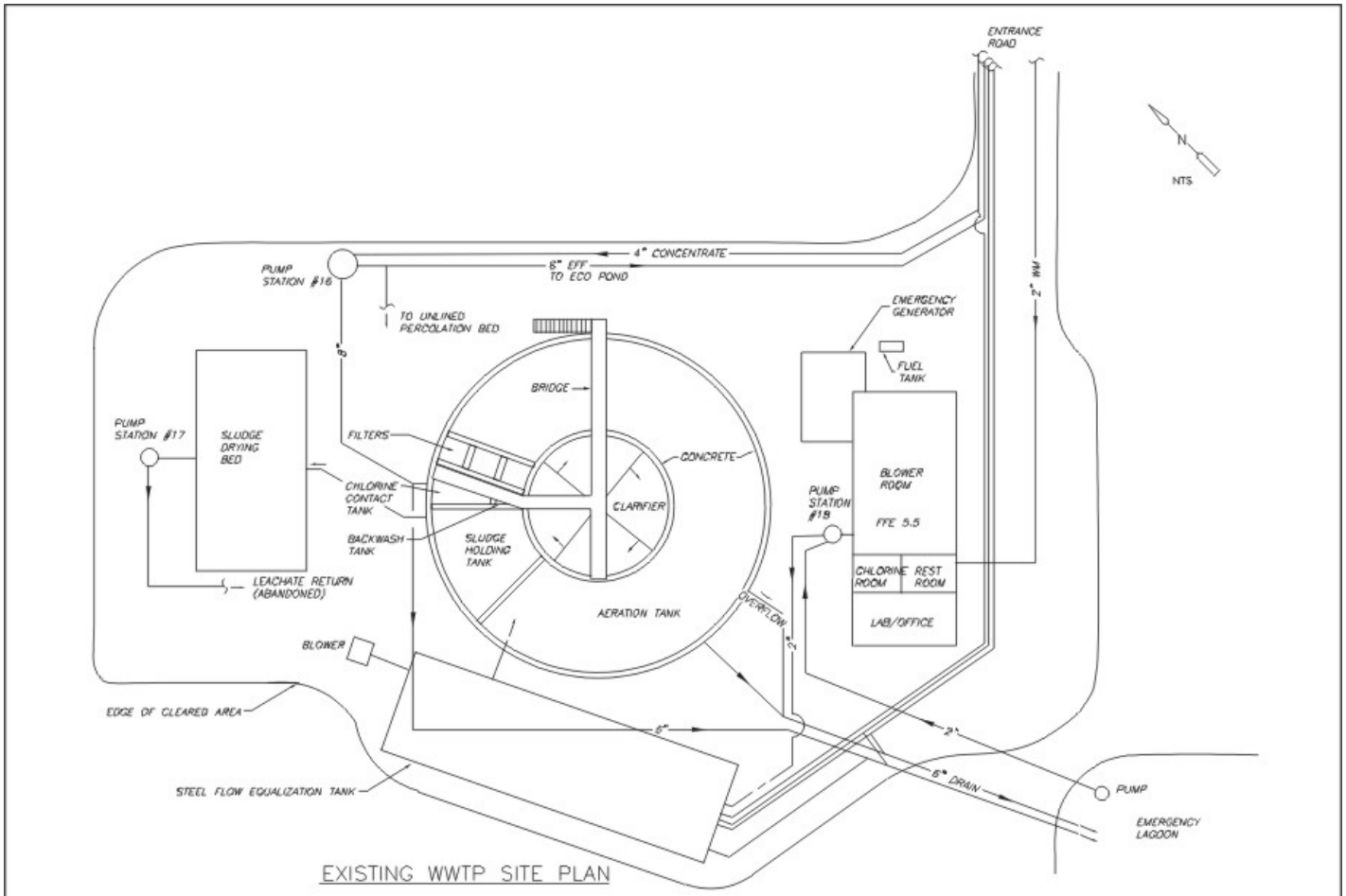


Figure 2

Everglades National Park
Project Area Layout



CDM

Figure: 3

National Park Service
Existing WWTP Site Plan

Pond migrates, as groundwater, northward where Outstanding Florida Waters occur. In an attempt to determine what Outstanding Florida Waters impacts might exist as a result of the northward flow, a transect study conducted by CDM (Appendix G) and a follow-up study conducted by park ecologists (Appendix H) attempted to measure various groundwater quality parameters to the north of Eco Pond. In that process, soil in the area was discovered to be non-transmissive "Florida marl," preventing groundwater from being drawn from wells driven to depths of approximately 8 feet. This finding indicates that there is little to no groundwater-to-surface water exchange, and therefore, no surface water, or Outstanding Florida Waters, impacts.

However, these same transect studies (Appendices G and H) indicated that there may be some seepage across the northern berm (levee) of Eco Pond into the Outstanding Florida Waters. Further studies are planned to determine the extent of possible leakage. If confirmed, an additional barrier screen will be placed within the berm, in the area of seepage, to a depth sufficiently into the marine clay layer below the berm to minimize or prevent seepage.

The National Park Service will submit the results of completed and pending studies with a summary conclusion to the Florida Department of Environmental Protection for a final determination as to whether or not surface waters (Outstanding Florida Waters) are influenced by groundwater infiltration from Eco Pond. In addition to evidence from the studies cited, it is also the opinion of park ecologists that there is no visual evidence to indicate an imbalance caused in the natural populations of aquatic flora surrounding Eco Pond, despite the past and present discharge of effluent with total phosphorus levels of at least 4,000-5,000 parts per billion into Eco Pond.

Other Projects and Plans

Other projects and plans that are in the vicinity of the Flamingo developed area and have the potential to affect the local environment include:

- **Flamingo Potable Water System Improvements**. On September 20, 2002, the National Park Service issued a Finding of No Significant Impact (FONSI) for the Flamingo Potable Water System Improvement project. With the environmental assessment and associated compliance completed, improvements to the Flamingo potable water system began in November 2002.

  The approved action consists of plugging and abandoning the existing freshwater wells and 16-mile transmission line along the main park road, drilling two saltwater wells near the existing water treatment plant, installing a reverse osmosis treatment system in the water treatment plant, and replacing the distributions system on an as-needed basis. Brine concentrate from the water treatment plant will be piped to the percolation pond near the wastewater treatment plant.

  This project will ensure a safe and adequate long-term supply of potable water for visitors and park employees. It is important to coordinate the potable water and wastewater improvement projects to ensure that there are no conflicts and to avoid duplication of efforts or scheduling delays, and to minimize environmental impacts. Additional information about the potable water project may be found on the Everglades National Park website at www.nps.gov/ever/planning/.

- **The Flamingo Road Realignment Plan.** Because this planned road realignment project would occur in the same location as the wastewater collection system repair, it would be important to coordinate these two projects to ensure that there are no conflicts with site location alignments and scheduling to avoid duplication of efforts or scheduling delays, and to minimize environmental impacts.

- **Flamingo Draft Comprehensive Site Plan, 1998**. The portion of this plan relating to the rehabilitation of Flamingo Campground (replacement of campgrounds/ comfort stations, campground kiosk, new RV dump station, and campground hostess RV developed site) would occur in the same general location as the wastewater collection system repair. These two planned actions should be coordinated to avoid duplication of efforts or scheduling delays, and to minimize environmental impacts. Completion of the comprehensive site plan is on hold until completion of the new park General Management Plan.

- **General Management Plan Everglades National Park.** Everglades National Park has recently initiated the preparation of a parkwide general management plan. As a matter of policy and professional commitment, this parkwide planning effort would evaluate and coordinate all park plan/actions to ensure compatibility with the long-term vision for the park.

Objectives

The objectives of this action are to:

- Upgrade the wastewater treatment system at Flamingo to meet the 2010 Florida Department of Environmental Protection standards for effluent discharge

- Minimize the impact on park resources by designing a wastewater treatment system that utilizes technologies to ensure that the system meets or exceeds established legal standards commensurate with the stewardship of this internationally significant protected area

- Ensure that the effluent from this wastewater system is disposed of in an environmentally sound manner

- Utilize existing surface disturbance to the greatest extent feasible

- Ensure that construction and operation associated with the upgrading of the wastewater treatment system do not adversely impact threatened and endangered species, especially with regard to surface disturbance-related impacts on the American crocodile

- Increase the life span and efficiency of the wastewater treatment system

- Utilize the existing wastewater treatment plant to the greatest extent possible

- Minimize adverse impact on visitors, concession operations, and park staff

- Use efficient and cost-effective actions in achieving the purpose and objectives of the project

Public Scoping

Public scoping is an early and open process to solicit public and internal concerns relating to a proposed action. The Council on Environmental Quality (CEQ 1978) guidelines for implementing the National Environmental Policy Act (NEPA) and the National Park Service (NPS) National

Environmental Policy Act guidelines contained in *Director's Order # 12: Conservation Planning, Environmental Impact Analysis and Decision Making Handbook* (NPS 2001a) require public scoping of federal actions that would require an environmental impact statement. Although public scoping is not required for an environmental assessment, the National Park Service conducted scoping on this wastewater upgrade for the Flamingo developed area to ensure input from all interested stakeholders. A six-page scoping brochure was distributed to 600 individuals, organizations, agencies, and Indian tribes and was posted on the park's website. The park also held two public scoping workshops in May 2002, one in Everglades National Park and one in Florida City.

For this Flamingo wastewater system improvement project, scoping helped define the range of wastewater system alternatives and identify the impact topics that should be considered for the project. A summary of public scoping comments may be found in Appendix B.

Value Analysis

A value analysis was finalized by the National Park Service on January 2001. During the value analysis process, an interdisciplinary planning team refines and evaluates design options that have the ability to meet project and NPS objectives. Potential impacts to the natural environment are also assessed. Through this process, suitable alternatives are identified for full analysis, and other options are dismissed from further consideration. The NPS evaluated several wastewater treatment alternatives to meet the Flamingo wastewater project needs:

- Option 1. Rehabilitate and upgrade the existing wastewater treatment plant as per the 2000 Design Analysis Report (NPS 2000d)
- Options 2-4. Rehabilitate and upgrade the existing wastewater treatment plant plus additional treatment options (Class III redundancy and anoxic box addition) as per the August Design Analysis Report
- Option 5. Construct a new package wastewater treatment plant and demolish the existing plant
- Option 6. Construct a new package wastewater treatment plant and mothball the existing plant
- Option 7. Take no action

In evaluating the attributes, advantages, and costs, the value analysis determined that Option 5 reflected the best cost/benefit per advantage when compared to the other options; however, it was left to the discretion of the final design to consider retaining components of the existing plant that are in good condition and operational.

ISSUES, CONCERNS, AND DERIVATION OF IMPACT TOPICS

The park staff identified issues and concerns related to the Flamingo Wastewater Treatment System Improvements project with input from the public, partners, agencies, and tribal organizations. The issues included:

- The effluent from the existing wastewater treatment plant does not consistently meet nitrate standards
- The existing control/equipment building is below 11-foot mean sea level and does not meet the Federal Emergency Management Agency standards for flood avoidance
- The wastewater treatment plant is reaching the end of its design life

- The steel grating and catwalks over the wastewater treatment plant are corroded

- The existing wastewater treatment plant has only one clarifier, making preventive maintenance difficult since the plant must stay in operation full time

- The deteriorated condition of the collection system allows infiltration and exfiltration, allowing raw sewage to escape and causing increased flow into the wastewater system during storm events, creating hydraulic surges to the wastewater treatment plant

- The harsh work environment and remoteness of the Flamingo wastewater treatment plant make it difficult to hire and retain certified plant operators

- The existing wastewater treatment plant is manually operated and does not have automated data recording, reducing operation efficiency

- The existing wastewater treatment plant is oversized, with no provision for taking portions of the plant out of operation to accommodate lower flows

Impact Topics

Impact topics were used to focus the evaluation of the potential environmental consequences of the alternatives. Candidate impact topics were identified based on legislative requirements, executive orders, topics specified in Director's Order #12 and Handbook (NPS 2001a), *Management Policies 2001* (NPS 2000c), guidance from the National Park Service, other agencies, public concerns, and resource information specific to Everglades National Park.

Impact Topics Analyzed in this Environmental Assessment

Specific impact topics were developed for discussion focus and to allow comparison of the environmental consequences of each alternative. These impact topics were identified based on federal laws, regulations, and executive orders; 2001 NPS management policies; and National Park Service knowledge of limited or easily impacted resources. A brief rationale for the selection of each impact topic is given below, as well as the rationale for dismissing specific topics from further consideration.

Impact topics are the resources of concern that could be affected by the range of alternatives. Specific impact topics were developed to ensure that alternatives were compared on the basis of the most relevant topics. The following impact topics were evaluated: vegetation; endangered, threatened, and protected species, and critical habitats; wetlands and floodplains; hydrology and water quality; wildlife and wildlife habitat; aquatic life; cultural resources; park operations; public health and safety; and, visitor use and experience.

The impact topics originally considered for the Flamingo wastewater collection and treatment upgrade at Everglades National Park are presented in Table 1. The table includes key regulations or policies for each impact topic. Based on site-specific conditions described below, several candidate impact topics were dismissed from further consideration. The rationale for dismissing impact topics is given below.

TABLE 1: IMPACT TOPICS FOR WASTEWATER SYSTEM UPGRADES AT FLAMINGO, EVERGLADES NATIONAL PARK

Impact Topic	Relevant Regulations or Policies
RETAINED	
Public health and safety	NPS *Management Policies 2001*
Hydrology and water quality	Clean Water Act, Executive Order 12088, Executive Order 11990, NPS *Management Policies 2001*
Wetlands and floodplains	Executive Order 11990, Clean Water Act Section 404, NPS Director's Order #77-1, Executive Order 11988
Wildlife and wildlife habitats	NPS *Management Policies 2001*
Endangered, threatened, or protected species and critical habitats	Endangered Species Act; NPS *Management Policies 2001*
Aquatic life	NPS *Management Policies 2001*
Vegetation	NPS *Management Policies 2001*
Cultural resources and Section 106 summary	Section 106; National Historic Preservation Act; 36 *CFR* 800; National Environmental Policy Act; Executive Order 13007; Director's Order 28; NPS *Management Policies 2001*
Visitor use and experience	Organic Act; NPS *Management Policies 2001*
Park operations	NPS *Management Policies 2001*
DISMISSED	
Air quality	Federal Clean Air Act (CAA), CAA Amendments of 1990 (CAAA), NPS *Management Policies 2001 Florida Administrative Codes Chapter 62: Air Resource Management Program.*
Ecologically critical areas or other unique natural resources	Wild and Scenic Rivers Act, 36 CFR 62 criteria for national natural landmarks, NPS *Management Policies 2001*
Prime and unique agricultural lands	Council on Environmental Quality 1980 memorandum on prime and unique farmlands
Soils	NPS *Management Policies 2001*
Soundscapes/Noise	NPS *Management Policies 2001*
Wilderness	1964 Wilderness Act, Director's Order 41, NPS *Management Policies 2001*
Conflicts with land use plans, policies, or controls	NPS *Management Policies 2001*
Economics	40 CFR 1500 Regulations for Implementing NEPA
Energy requirements and conservation potential	NPS *Management Policies 2001*
Environmental justice	Executive Order 12898
Indian trust resources	Department of the Interior Secretarial Order No. 3206, Secretarial Order No. 3175
Natural or depletable resource requirements and conservation potential	NPS *Management Policies 2001*

Each of the retained topics had several issues that merited discussion. Those issues, discussed in detail in the "Affected Environment and Environmental Consequences" section, include the following preliminary list of impact topics:

- Public health and safety was retained because of the potential for human contact with raw sewage from a failing collection system or an inefficient treatment plant

- Hydrology and water quality were retained because effluent from the existing wastewater plant does not consistently meet nitrate standards, the collection system allows untreated graywater and sewage to escape and there is a potential for leakage of treated wastewater from Eco Pond into adjacent surface waters (Outstanding Florida Waters)

- Wetlands and floodplains were retained because water quality issues are critical to wetland function, and the Flamingo area is within the designated 100-year coastal floodplain and any development in this area must be review for potential flood impacts

- Wildlife, protected species and aquatic life were retained because the Flamingo area is home to an abundance of wildlife, including marine and freshwater species, as well as several protected species. Additionally, the park intended this environmental document to serve as the basis for appropriate consultation with those agencies charged with protecting wildlife and protected species

- Vegetation was retained because the Flamingo area supports a variety of plant communities, including mangroves, coastal prairie, and exotic species

- Cultural resources were retained because at the time of scoping, there was insufficient information to make determinations regarding presence or absence of historic properties. Additionally, the park intended this environmental assessment to serve as the basis for appropriate consultation with those agencies charged with preservation of cultural resources

- Visitor use and experience was retained because the Flamingo area receives heavy visitation, including overnight stays in a lodge and campgrounds. Eco Pond, a constructed percolation pond, is popular with visitors because of the concentration of wildlife easily viewed from its boardwalk. Any construction activities within the visitor use area, such as trenching of collection lines or work along roadsides, would impact the visitor experience

- Park operations was retained because operation of the wastewater treatment facility is the responsibility of park facilities and maintenance staff. Changes in wastewater management would have the potential to affect park operations by impacting these park employees

Impact Topics Dismissed from Further Analysis (Rationale for Dismissal)

Air quality: Everglades National Park enjoys a Class I clean air status. Lands with this designation are subject to the most stringent regulations. Very limited increases in pollution are permitted in the vicinity. This high air quality is a valuable park resource, enhancing visitation by providing clean air and high visibility to match the unique ecosystem experience. The Clean Air Act of 1963 (42 USC 7401) requires federal land managers to protect air quality, and the 2001 NPS Management Policies direct air quality to be analyzed when planning park projects and activities. The Flamingo project area is developed, and receives approximately

150,000 visitors annually, most arriving by automobile. The no action alternative proposes no construction activities, and no change in air quality would result. Under the preferred alternative, surface disturbance is minimal, and fugitive dust would not likely affect visitors or staff. Because of the high water table, it is unlikely that large quantities of dust would be generated, and any occurrence of construction dust would be localized and very transient. Emissions from construction vehicles would be kept to a minimum by restricting idling time. In the context of activities and facilities at Flamingo, no appreciable effects to air quality would be anticipated under either alternative.

Ecologically critical areas: Everglades National Park does not contain any designated ecologically critical areas, wild and scenic rivers, or other unique natural resources, as referenced in 40 CFR 1508.27.

Prime and unique agricultural lands: Prime farmland has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Unique agricultural land is land other than prime farmland that is used for production of specific high-value food and fiber crops. Both categories require that the land is available for farming uses. Lands within Everglades National Park are not available for farming and therefore do not meet the definitions.

Soils: None of the proposed activities included in this assessment would create new disturbance at Everglades National Park. The project area is within the previously developed areas of Flamingo that include infrastructure components, visitor facilities and park housing. Any topsoil disturbance would be mitigated by banking and returning the soil to its original location after construction activities were complete. No notable effect to soils resources in the park would be anticipated to result from any alternative evaluated in this assessment.

Soundscapes/Noise: The National Park Service must strive to preserve the natural quiet and natural sounds associated with the physical and biological resources of the park. Alternatives addressed in this document have little or no potential to adversely affect the soundscape of the Flamingo developed area. The existing noise level of the vicinity includes traffic and other sounds of visitor use and park maintenance and operations. The sounds of the wastewater treatment plant operation would not likely be heard more than a few yards outside the water treatment plant building. Noise associated with construction of Alternative B, the preferred alternative, would be short-term and negligible.

Wilderness: Everglades National Park contains 1,296,500 acres of designated wilderness, or 86 percent of the total park area. Development in the park is limited to corridors associated with visitor use and the presence of existing services, utilities, and infrastructure. The actions proposed in the alternatives are limited to the developed area of Flamingo. None of the proposed actions would affect wilderness resources or values of Everglades National Park.

Conflicts with land use plans, policies, or controls: Refer to the section “Project’s Relationship to Other Plans” for a discussion of the conflicts with other plans.

Economics: None of the alternatives described in this environmental assessment would have notable effects on local or regional economic activities. Tourism and visitor contributions to the local economy would not be affected by continuation of current management nor by upgrading of the wastewater treatment system. The south Florida economy is large and supported by a multitude of activities. Construction activities associated with the preferred alternative would not contribute measurably to the local or regional economy.

Energy requirements and conservation potential: The National Park Service reduces energy costs, eliminates waste, and conserves energy resources by using energy-efficient and cost-effective technology. Energy efficiency is incorporated into the decision-making process during the design and acquisition of buildings, facilities, and transportation systems that

emphasize the use of renewable energy sources. The proposed action alternative does not include increased wastewater treatment capacity, which would require increased energy usage; nor does it call for increased transportation of sludge to locations outside the park. These design components would conserve energy usage, consistent with park service mandates.

Environmental justice: Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires that all federal agencies address the effects of policies on minorities and low-income populations and communities. Flamingo developed area contains no minority or low-income populations or communities as defined in the Environmental Justice Guidance (July 1996). Therefore, none of the alternatives would have disproportionate health or environmental effects on populations of concern.

Indian trust resources: Indian trust assets are owned by American Indians but held in trust by the United States. Requirements are included in the Secretary of the Interior's Secretarial Order No. 3206, "American Indian Tribal Rites, Federal – Tribal Trust Responsibilities, and the Endangered Species Act," and Secretarial Order No. 3175, "Departmental Responsibilities for Indian Trust Resources." According to Everglades National Park staff, Indian trust assets do not occur within Everglades National Park. There are no Indian trust resources downstream of the project area (Florida Bay). Therefore, there would be no downstream effects on Indian trust resources from either proposed alternative.

Natural or depletable resource requirements and conservation potential: Sustainable practices minimize the short- and long-term environmental impacts of development and other activities through resource conservation, recycling, waste minimization, and the use of energy-efficient and ecologically responsible materials and techniques. Project actions would not compete with dominant park features or interfere with natural processes, such as the seasonal migration of wildlife or hydrologic activity associated with wetlands.

ALTERNATIVES

Two alternatives are analyzed in this environmental assessment: Alternative A - No Action and Alternative B - the Preferred Alternative. Alternative B is preferred because it best meets the objectives associated with the purpose of the proposed action.

Alternatives that were considered but dismissed are described briefly, along with their reasons for their dismissal, in the following section.

Refer to Figures 1 and 2 for the location maps of the project site.

DESCRIPTION OF THE ALTERNATIVES

The alternatives section describes two alternatives for the Flamingo Wastewater Treatment System. Alternatives for this project were developed to resolve the issues identified previously in this document. The no action alternative describes the action of continuing the present management operation and condition. It does not imply or direct discontinuing the present action or removing existing uses, developments, or facilities. The no action alternative provides a basis for comparing the management direction and environmental consequences of the preferred alternative. Should the no action alternative be selected, the National Park Service would respond to future needs and conditions associated with the park's issues without major actions or changes from the present course.

The preferred alternative presents the National Park Service proposed action and defines the rationale for the action in terms of resource protection and management, visitor use and operational use, costs, and other applicable factors.

The National Park Service has adopted the concept of sustainable design as a guiding principle of facility planning and development. The objectives of sustainability are to design park facilities to minimize adverse effects on natural and cultural values, to reflect their environmental setting, and to maintain and encourage biodiversity; to construct and retrofit facilities using energy-efficient materials and building techniques; to operate and maintain facilities to promote their sustainability; and to illustrate and promote conservation principles and practices through the sustainable design and ecological sensitive use. Essentially, sustainability is living within the environment with the least impact on the environment. The preferred alternative subscribes to and supports the practice of sustainable planning, design, and use of the wastewater treatment facility.

Alternative A: No Action / Continue Current Management

Continue current management / no action is the baseline condition against which proposed activities are compared. It is defined as taking no action to change or alter current management.

Under the no action alternative, there would be continued utilization of the existing permitted 90,000 gallon-per-day, extended-aeration wastewater treatment plant (primary and secondary treatment) and associated collection/disposal systems with no upgrade or improvements (Figure 3, National Park Service Existing WWTP Site Plan).

Wastewater generated in the Flamingo area is conveyed by a system of gravity sewers and 16 sewage lift (pump) stations to an extended aeration wastewater treatment plant. The effluent from the wastewater treatment plant is then transferred to Eco Pond, a manmade percolation pond (Eco Pond). (See photos, Appendix D)

Approximately 24,000 feet of pipe and 16 lift stations comprise the wastewater collection system that serve the marina/store, a gas

station, a restaurant, an overnight lodge, a campground, a picnic area, park maintenance facilities, a visitor center, and an employee residential area. Due to age, the existing collection system experiences inflow and infiltration problems. This condition results in the infiltration of groundwater into the system, as well as exfiltration of wastewater out of the system. This condition must be corrected for continued regulatory compliance and proper plant operation.

The wastewater treatment plant was built in 1973. Its catwalks are deteriorating and pose a safety hazard, and the plant requires frequent repairs (for example, major maintenance repairs are performed twice a year). Also, some existing plant structures do not meet the Federal Emergency Management Administration standard of being at least 11 feet above mean sea level to avoid flooding during a major hurricane.

The existing wastewater plant consists of both primary and secondary treatment, including a comminutor and screen (devices to grind and remove trash prior to wastewater treatment), a flow equalization tank, an aeration basin, a clarifier, sand filters, a chlorine contact tank, and an effluent pump station. Sludge from the plant is hauled out of the park four or five times a year to an authorized county wastewater plant where it undergoes further treatment. The effluent from the existing wastewater treatment plant has been unable to consistently meet the currently permitted maximum effluent discharge standard of 12 parts per million for nitrate. Regular groundwater monitoring adjacent to Eco Pond however, has consistently given results well below the groundwater limit of 10 parts per million for nitrate. Given these test results, the wastewater treatment plant has remained in compliance with the plant's operating permit and current state regulations.

However, the existing system will not be able to meet 2010 state regulatory requirements for total nitrogen (10 parts per million) and total phosphorus limits (1 part per million) in plant effluent.

A fenced, one million gallon, lined lagoon is located adjacent to the wastewater plant and serves as an emergency holding basin (two-week holding capacity) for raw sewage during periods when the wastewater treatment plant is shut down for repairs (see photo, Appendix D). After repairs, a pump in the lined lagoon pumps the raw sewage back into the plant for processing. The area around the lagoon is sprayed with a U.S. Environmental Protection Agency approved herbicide (Rodeo®) to control weeds.

NPS is permitted to discharge 90,000 gallons per day (3 month average daily flow) of effluent into a percolation pond (Eco Pond). The effluent is discharged and pumped approximately one mile through a 6-inch PVC pipe from the wastewater plant into an 8-acre manmade percolation pond (Eco Pond), located approximately one mile southwest of the wastewater plant adjacent to the main Flamingo park road (see photo, Appendix D). Monitoring wells adjacent to Eco Pond are maintained to ensure that groundwater quality standards are being achieved.

Although artificial, Eco Pond is the only "freshwater pond" in the immediate vicinity, and supports abundant aquatic life. This is a phenomenon shared by sewage treatment facilities elsewhere in the country. Eco Pond is popular among visitors as an aquatic/wildlife viewing area. It is next to the main Flamingo park road, where the park provides a small parking area, an elevated viewing structure, and a path around the pond. To maintain the visual appeal and promote wildlife viewing, the park sprays the lush cattail growth once a year with Rodeo® herbicide.

An unfenced percolation pond adjacent to the existing lined wastewater lagoon serves as a permitted backup for Eco Pond (see photo, Appendix D).

Alternative B: The Preferred Alternative

Alternative B has been identified as the preferred alternative because it meets the objectives associated with the purpose and need for the proposed action and is the environmentally preferred alternative.

This alternative provides for upgrading and modifying of the existing 90,000 gallon-per-day, extended-aeration wastewater treatment plant (primary and secondary treatment) on the same site. Because the future flows will not be higher than current flows, the upgraded plant would treat the same quantity of wastewater as the old plant. A new package plant would be installed adjacent to the existing plant. The proposed new plant would use a membrane filtration system, and would use chemical treatment and filtration to precipitate phosphorus. Most components of the existing wastewater treatment system would be demolished and removed from the park with the exception and reuse of the surge tank, lift station, clarifier tank, and lined lagoon. This upgrading and replacement of the existing wastewater plant would be accomplished onsite and would upgrade the system to meet or exceed 2010 Florida Department of Environmental Protection standards for 10 parts per million Bio-Chemical Oxygen Demand (BOD), 10 parts per million Total Suspended Solids (TSS), 10 parts per million total nitrogen, and 1 part per million total phosphorus limits.

The new treatment system would meet, as a minimum, U.S. Environmental Protection Agency Class III reliability standards. New structures and critical equipment would be raised on piles and columns to at least 11 feet above mean sea level to avoid flooding during hurricane events. All structures are expected to fit within the existing open mowed area.

The collection system (lines and lift stations) would be tested and deteriorated sections repaired or replaced.

Effluent (90,000 gallons per day presently permitted) from the upgraded wastewater plant would continue to be pumped through the existing 6-inch force main approximately one mile to Eco Pond. The existing monitoring wells adjacent to Eco Pond would be maintained to ensure that groundwater quality standards continue to be achieved. Cattail growth would continue to be controlled by the application of U.S. Environmental Protection Agency–approved herbicides to maintain the value of the pond as a major visitor attraction for aquatic/wildlife viewing.

The unfenced percolation pond adjacent to the lined sewage lagoon would continue to be used as a permitted backup sewage effluent disposal site for Eco Pond, as well as a disposal site for the reject brine water (180,000 gallons per day – average in high visitation season-permit pending) from the proposed reverse-osmosis potable water treatment plant.

Sludge would be disposed of in the same manner as presently required by the wastewater treatment plant operating permit. It would be transferred from the plant into pump trucks and transported to a licensed Miami-Dade County wastewater treatment plant for further treatment and disposal.

Design of the new wastewater treatment plant would be such that all pertinent regulations and criteria regarding the quality of wastewater discharge would be met or exceeded. See “Project Background” (begins on page 3 of this document) for an extended discussion of the pertinent regulations and criteria.

Alternative B would be the environmentally preferred alternative. The rationale for this decision is presented in the following section.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

In accordance with Director's Order #12 (NPS 2001a), the National Park Service is required to identify the "environmentally preferred alternative" in all environmental documents, including environmental assessments. The environmentally preferred alternative is determined by applying the criteria suggested in the 1969 National Environmental Policy Act, which is guided by the Council on Environmental Quality. The Council on Environmental Quality provides direction that "the environmentally preferred alternative is the alternative that will promote the national environmental policy as expressed in Section 101 of the National Environmental Policy Act, which considers: (1) fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations; (2) assuring for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings; (3) attaining the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences; (4) preserving important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice; (5) achieving a balance between population and resource use which would permit high standards of living and a wide sharing of life's amenities; and (6) enhancing the quality of renewable resources and approach the maximum attainable recycling of depletable resources." The environmentally preferred alternative for the proposed Flamingo Wastewater System Improvements project is based on applying these national environmental policy goals to the evaluation and decision-making processes.

The preferred alternative would attain the widest range of beneficial uses of the environment, biological resource protection, visitor safety and enjoyment, and cultural resource protection, without degradation of resources. Specifically, Alternative B would provide a higher level of health and safety for visitors and park employees when compared to the no action alternative by providing a dependable wastewater system that would consistently meet all federal, state, and local standards. Wastewater plant modifications would be made to reduce total nitrogen and phosphorus to 2010 Florida Department of Environmental Protection standards, providing for a safe, efficient, reliable, and environmentally sound wastewater system. The repair and replacement of wastewater collection system piping would reduce impacts on the environment and improve the efficiency of the upgraded wastewater treatment plant by reducing inflow of additional water. The reduction of nitrogen and phosphorus from plant effluent would have a beneficial impact on Eco Pond and the surrounding wetlands, while allowing continued use of Eco Pond as a major visitor attraction for viewing aquatic/wildlife.

The no action alternative would not provide a long-term, reliable wastewater treatment system that would consistently meet federal, state, and local standards. Under the no action alternative, resource impacts, especially on wetlands, might be expected to increase with the continued deterioration of the existing wastewater treatment system. Also, the increased maintenance expected with continued use of the existing water treatment system would have long-term adverse impacts on park operations. Thus the no action alternative does not meet national environmental policy goals as well as the preferred alternative.

Mitigation Measures

Best management practices and mitigation measures would be used to prevent or minimize potential adverse effects associated with the proposed action alternative. These practices and measures would be incorporated into the project construction documents and plans to ensure that major adverse impacts

would not occur. Mitigation measures undertaken during project implementation would include, but not strictly be limited to, those listed in Table 2, below.

TABLE 2: MITIGATION MEASURES AND BEST MANAGEMENT PRACTICES

Potential Adverse Effect	Mitigation Measure or Best Management Practice
Direct effects from construction activities	Fencing of all construction areas to confine potentially adverse activities to the minimum area required for construction. All protection measures would be clearly stated in the construction specifications, and workers would be instructed to avoid conducting activities beyond the fenced construction zone.
Erosion resulting from construction-related surface disturbance	The contractor would be required to implement stormwater pollution prevention plan measures prior, during and following ground disturbing activities. Standard erosion control measures such as sand bags would be used to minimize soil erosion. Erosion barriers would be inspected and maintained regularly to ensure effectiveness. The primary measure used to control stormwater runoff would be installation of temporary silt fencing. Silt fences are made of synthetic fabric and are placed in drainage contours to trap sediments generated during construction.
Construction would affect areas previously undisturbed	Construction activities would take advantage, where possible, of sites where previous disturbance has already had adverse effects.
Contamination of soil by petrochemicals from construction equipment and maintenance of wastewater treatment system	Areas used for equipment maintenance and refueling would be minimized and surface runoff in these areas would be controlled. Equipment would be checked frequently to minimize leaks and potential contamination. All chemicals used in the wastewater treatment process would be transported, stored, and used following federal, state, and local regulations and standards.
Direct effects from construction and operation of rehabilitated wastewater system on threatened and endangered species, wildlife, and habitat	Pre-construction surveys would be conducted to avoid nesting sites of the federally listed, endangered American crocodile and the osprey (Florida species of special concern). The park would use its best professional judgment in applying standard protection measures for the Eastern indigo snake (see Appendix J).
Wildlife disturbance resulting from construction activities, including noise	To reduce potential impacts on wildlife, construction activities occurring near sensitive habitats would be timed to avoid periods of breeding, nesting and rearing of young. Construction would occur only during daylight hours to reduce effects on nocturnal foraging or rest. For example, if resource specialists determine noise levels are interfering with normal osprey nesting activities, operations would be temporarily suspended until fledging of young was complete.
Direct effects from construction and operation of rehabilitated wastewater system on the visitor experience and park staff	To lessen adverse effects on the visitor experience, construction information would be posted in strategic locations and made available on the park's website. Construction would utilize a rotation system to minimize disruption of visitor access and use of the Flamingo developed area. Where possible, all construction activities would be timed to avoid high visitor use periods.
Protection of cultural resources	Avoid historical sites/structures and archeological sites whenever possible. Educate personnel about the nature of the cultural resources at the project site and the need for protection. Monitor construction, and include stop-work provisions in construction documents should archeological or paleontological resources be uncovered.
Discovery of unknown archeological resources or human remains	If previously undiscovered archeological resources are unearthed, work would be stopped in the area of any discovery and the park would consult with the National Park Service Southeast Archeological Center, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation, as appropriate. Because the project site is not in a high probability area, it is unlikely that any cultural resources would be encountered or impacted.
Visitor experience	Prepare bulletins to educate visitors on the purpose of projects.
Public health and safety	Provide traffic flow control, signage and flagging to protect visitor and staff safety during construction activities.
Disturbance of state listed plant species	In construction areas near state-listed plant species; identify, flag and avoid these species to eliminate potential adverse effects.

TABLE 2: MITIGATION MEASURES AND BEST MANAGEMENT PRACTICES (CONTINUED)

Floodplain impacts	The preferred alternative would reduce the overall developed footprint in the 100-year floodplain. Replacement of deteriorated sewer mains would reduce direct disturbance of the floodplain by removing the need for long-term maintenance and stop the leaching of sewage into groundwater. However, because the wastewater treatment plant and discharge pond is located in a high hazard area, the risk to property can be reduced through mitigation but cannot be eliminated. In accordance with EO 11988, flood protection would be provided for the new wastewater treatment building by elevating and securing the structure on piles above flood elevation level rather than by fill. The raw influent discharge pipe would be elevated above the rim of the treatment tank(s) and designed to discharge above the base flood elevation into the tank. Existing pump station valves are located below ground and any sewer mains to be replaced would be properly embedded to minimize damage from surface erosion, debris and flooding. During flooding, pump stations are shut down. Valves would be protected from debris impact, velocity flow, wave action and erosion. Treatment plant pump stations are equipped with an emergency mobile gasoline generator powered connector and pump-around piping in the event of pump failure. To improve the protection of park property a wastewater treatment plant hurricane hazard plan would be developed. This plan will address pre and post hurricane preparedness measures in accordance with the *Hurricane Preparedness for Domestic Wastewater Treatment Plants* guidelines established by the Florida Department of Environmental Protection. The National Park Service will continue to operate these facilities using the Everglades National Park Hurricane Plan, an operational hazard implementation plan that lowers the threat to life and property. This plan is coordinated with the Dade, Collier and Monroe County Departments of Emergency Management. The plan is reviewed and updated annually to ensure maximum human safety.
Impact to Outstanding Florida Waters due to potential seepage of treated effluent through the berm of Eco Pond	The NPS will investigate the possibility of lateral leakage through the levee at Eco Pond. In the event any seepage is discovered, a barrier curtain will be installed to negate any resulting connection between discharges into Eco Pond and surface waters (Outstanding Florida Waters) to the north of the pond.

ALTERNATIVES CONSIDERED BUT REJECTED

Construct a new Flamingo Wastewater Treatment Plant and "mothball" the existing plant to avoid demolition costs.

The alternative of constructing a new plant and mothballing the existing plant was considered but rejected because it would violate National Park Service policy, which prohibits retaining structures in a national park that are no longer functional. "When structures that are not historically significant are no longer functional in their present locations, and are determined to be inappropriately placed in important resource areas, they will be removed or relocated to a more appropriate area" (NPS 2000c).

Pump wastewater to a Miami-Dade County treatment facility (intersection of Florida State Road 9336 and Tower Road).

The cost of developing a 47-mile transmission system with numerous lift stations from the park to a Miami-Dade County facility would be expensive ($14,285,000 – estimate provided by CDM). Also, because approximately 50 miles of the new collection system/sewer main would be inside the park, the trenching and the potential for sewage spills would have both short- and long-term potential for major adverse impacts to this sensitive wetlands ecosystem. The alternative would also have the potential for encouraging commercial and residential development on prime agriculture lands adjacent to the park.

Dispose of wastewater effluent via deep well injection.

Deep well injection for the Flamingo wastewater treatment system effluent would be expensive ($4-5 million) and has an unknown probability of success. Deep well injection requires locating a confinement layer that seals off wastewater from groundwater aquifers. There is always the possibility that a confinement layer might not be located, which would also result in a total loss of expenditures. The permitting for deep well injection is also complicated and controversial due to the potential for long-term aquifer contamination.

Redirection of wastewater effluent to the existing percolation pond adjacent to the wastewater treatment plant.

The existing percolation pond adjacent to the wastewater plant will receive the brine reject water (estimated at 180,000 gallons per day) from the Flamingo reverse-osmosis water treatment plant. The conversion of the existing potable water treatment plant to a reverse-osmosis system is anticipated by the end of 2003. This project is fully described in the Flamingo Potable Water System Improvements Environmental Assessment (NPS 2002b). Although the percolation pond is assumed to have the capacity to accept an additional 90,000 gallons per day of effluent from the wastewater treatment plant, the percolation rate of the pond is yet to be scientifically determined. The percolation pond presently serves as a backup for treated wastewater discharges to Eco Pond.

This alternative was also rejected because it would reverse a long-standing precedent of established visitor use in the Flamingo area. Eco Pond is a constructed percolation pond that currently receives effluent from the existing wastewater treatment plant. It has been in use since the mid-1970s and has now become a popular visitor attraction for aquatic/wildlife viewing. It is the only "freshwater" habitat in the southern end of the park. The National Park Service has formalized this area for visitor use by providing a parking area, a viewing platform and a trail around the pond. If the wastewater effluent was permanently diverted to the percolation pond near the existing wastewater plant, then Eco Pond would essentially dry up and cease to exist.

Although the potential elimination of Eco Pond would comply with National Park Service Management policy that encourages the "restoration of natural functions and processes," the extenuating circumstances associated with the value now placed on this high profile visitor use site would require additional planning, assessment and public input that are beyond the scope of this wastewater project. However, this wastewater project would not preclude such future considerations.

Reuse of wastewater effluent.

Another project which has recently undergone environmental analysis in the Flamingo area is the Flamingo Potable Water System Improvements (see description on page 8). The approved action for this project involves reverse osmosis which will require the discharge of concentrated brine into the environment. This brine discharge is expected to cause minor to moderate adverse effects on vegetation and wetlands. During public review of the environmental assessment for this project, some reviewers raised the possibility of reuse of treated wastewater, in order to reduce potable water demand and thereby reduce the quantity of brine discharge. The applicable regulation pertaining to this matter is Florida Administrative Code (FAC) Rule 62-610, Part III, Slow-Rate Land Application Systems; Public Access Area, Residential Irrigation, and Edible Crops.

As discussed in the rule, there are a number of potential uses for reused water. These uses were individually determined not to be viable as explained below. Additionally, these potential uses have their own environmental impacts, such as facility construction and the trenching of new distribution piping, which would need to be further analyzed.

Landscape irrigation: The landscape in Flamingo is not irrigated. Therefore, wastewater reuse for this purpose would not lower potable water demand. This area already receives a high amount of rainfall, and irrigation would increase the growth rate of the lawns, thereby increasing maintenance costs associated with mowing.

Vehicle and boat washing: Facilities for washing vehicles do not exist in Flamingo. Government and concessioner boats are often hosed down with freshwater while afloat. The quantity of water used for such cleaning is considered insignificant, and discharge of reused water would not be permitted to surface waters (Outstanding Florida Waters).

Fire protection (hydrants and building sprinklers): Fire flows are rare, and potential water savings are negligible.

Flushing of sanitary sewers, and cleaning of roads, sidewalks, and outdoor work areas: A program for the flushing of sanitary sewers does not exist in Flamingo. Water use for the cleaning of roads, sidewalks, and outdoor work areas is either non-existent or negligible.

Toilet flushing: Although the motel and concessioner employee apartments could be retrofitted for wastewater reuse, the number of hotel guests and residential concession employees is highly seasonal and is minimal to zero for many months of the year. Additionally, the costs associated with converting toilets for wastewater reuse are substantial.

Effluent directly into Florida Bay.

This alternative would not be permitted by the Florida Department of Environmental Protection and would compromise the park's stewardship mission to protect park resources for the benefit of future generations.

Construction of "living" wastewater treatment system.

Living systems or "green" type wastewater treatment systems were discussed but dismissed. The primary reason for dismissal

was that this type of process would require the conversion of an undisturbed wetland to a constructed wetland. The consequences may impact pristine wetlands and would probably require the introduction of plants/seeds that are found in freshwater as opposed to marine environments. In addition, these systems cannot reduce total phosphorus to 10 parts per billion. Eco Pond is in fact a type of "living" system, but the total value of its ability to remove nutrients is unknown.

HOW THE ALTERNATIVES MEET THE OBJECTIVES OF THE PROPOSED ACTION

Alternative A, the no action alternative, would not meet the project objectives. Potential adverse impacts to water resources could be expected due to the continued use of aged collection system piping and the continued operation of a deteriorating wastewater treatment plant. There is also potential that federal, state, and/or local standards would not be met.

Alternative B, the proposed action, would meet the project objectives because it would result in the installation of an upgraded wastewater treatment plant and a rehabilitated collection system. The proposed action would:

- Upgrade the wastewater treatment system at Flamingo to meet the 2010 Florida Department of Environmental Protection standards for effluent discharge
- Minimize the impact on park resources by designing a wastewater treatment system that utilizes technologies to ensure that the system meets or exceeds established legal standards commensurate with the stewardship of this internationally significant protected area
- Ensure that the effluent from this wastewater system is disposed of in an environmentally sound manner
- Utilize existing surface disturbance to the greatest extent possible
- Ensure that construction and operation of the improved wastewater treatment system does not adversely impact threatened and endangered species, especially with regard to surface disturbance-related impacts on the American crocodile
- Increase the life span and efficiency of the wastewater treatment system
- Utilize the existing wastewater treatment plant to the greatest extent possible
- Minimize adverse impact to visitors, concession operations, and park staff
- Utilize efficient and cost-effective actions in achieving the purpose and objectives of the project

COMPARISON OF ALTERNATIVE EFFECTS

The terms used to define the magnitude or intensity of the effects (e.g., negligible, minor) are described below in Table 3. Table 4 presents a summary comparison of the effects of the alternatives based on the evaluations of the impact topics in the “Environmental Consequences” section of this environmental assessment.

TABLE 3: DEFINITIONS OF IMPACT THRESHOLDS

Impact Topic	Impact Threshold Definition				Duration
	Negligible	**Minor**	**Moderate**	**Major**	
Public health and safety	Public health and safety would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on the public health or safety.	The effect would be detectable, but would not have an appreciable effect on public health and safety. If mitigation were needed, it would be relatively simple and likely successful.	The effects would be readily apparent, and would result in substantial, noticeable effects to public health and safety on a local scale. Changes in disease rates or injury could be measured. Mitigation measures would probably be necessary and would likely be successful.	The effects would be readily apparent, and would result in substantial, noticeable effects to public health and safety on a regional scale. Changes could lead to mortality. Extensive mitigation measures would be needed, and their success would not be guaranteed.	Short-term – Effects occur only during project implementation activities. Long-term – Effects extend beyond project implementation activities.
Hydrology and water quality	Impacts would not be detectable. Water quality parameters would be well below all water quality standards for the designated use of the water. Both quality and quantity of flows would be within historical conditions.	Impacts would be measurable, but water quality parameters would be well within all water quality standards for the designated use. Both quality and quantity of flows would be within the range of historical conditions, but measurable changes from normal flows would occur. State water quality and antidegradation policy would not be violated.	Changes in water quality or hydrology would be readily apparent, but water quality parameters would be within all water quality standards for the designated use. Water quality or flows would be outside historic baseline on a limited time and space basis. Mitigation would be necessary to offset adverse effects, and would likely be successful. State water quality and antidegradation policy would not be violated.	Changes in water quality or hydrology would be readily measurable, and some quality parameters would periodically be approached, equaled, or exceeded. Flows would be outside the range of historic conditions, and could include flow cessation or flooding. Extensive mitigation measures would be necessary and their success would not be assured. State water quality regulations and antidegradation policy may be violated.	Short-term - Following implementation activities, recovery would take less than one year Long-term - Following implementation activities, recovery would take longer than one year

TABLE 3: DEFINITIONS OF IMPACT THRESHOLDS (CONTINUED)

Impact Topic	Impact Threshold Definition				Duration
	Negligible	Minor	Moderate	Major	
Wetlands and floodplains	Wetlands or floodplains would not be affected, or effects to the resource would be below or at the lower levels of detection. No long-term effects to wetlands or floodplains would occur and any detectable effects would be slight. No U.S. Army Corps of Engineers 404 permit would be necessary.	The effects to wetlands or floodplains would be detectable and relatively small in terms of area and the nature of the change. A U.S. Army Corps of Engineers 404 permit would not be required. No long-term effects to wetlands or floodplains would occur.	The alternative would result in effect to wetlands or floodplains that would be readily apparent, including long-term effects on wetland vegetation, such that a U.S. Army Corps of Engineer 404 permit could be required. Wetland or floodplain functions would not be affected in the long-term	Effects to wetlands or floodplains would be observable over a relatively large area, would be long-term, and would require a U.S. Army Corps of Engineers 404 permit. The character of the wetland or floodplain would be substantially changed.	Short-term - Following treatment, recovery would take less than one year Long-term - Following treatment, recovery would take longer than one year
Wildlife and wildlife habitats	Wildlife and their habitats would not be affected or the effects would be at or below the level of detection and would not be measurable or of perceptible consequence to wildlife populations.	Effects to wildlife and habitats would be measurable or perceptible, but localized within a small area. While the mortality of an individual animal might occur, the viability of wildlife populations would not be affected and the community, if left alone, would recover.	A change in wildlife and habitats would occur over a relatively large area. The change would be readily measurable in terms of abundance, distribution, quantity, or quality of population. Mitigation measures would be necessary to offset adverse effects, and they would likely be successful.	Effects to wildlife would be readily apparent, and would substantially change wildlife populations over a large area in and out of the national park. Extensive mitigation would be needed to offset adverse effects, and its success could not be assured.	Short-term - Recovers in less than 1 year. Long-term - Takes more than 1 year to recover.

TABLE 3: DEFINITIONS OF IMPACT THRESHOLDS (CONTINUED)

Impact Topic	Impact Threshold Definition				Duration
	Negligible	Minor	Moderate	Major	
Endangered, threatened, and protected species, and critical habitats	No Effect: Impacts would not affect listed or protected species or designated critical habitat.	May Affect/Is Not Likely to Adversely Affect: Effects on special status species would be discountable (i.e., adverse effects are unlikely to occur or could not be meaningfully measured, detected, or evaluated) or completely beneficial.	May Affect/Likely to Adversely Affect: Adverse effects to a listed species might occur as a direct or indirect result of the proposed action and the effect would either not be discountable or completely beneficial. Moderate impacts to species would result in a local population decline due to reduced survivorship, declines in population, and/or a shift in the distribution; no direct casualty or mortality would occur.	Likely to jeopardize the continued existence of a species/Adversely modify critical habitat: Effects could jeopardize the continued existence of a listed or proposed species or adversely modify designated critical habitat within and/or outside the park boundaries. Major impacts would involve a disruption of habitat and breeding grounds of a protected species such that direct casualty or mortality would result in removal of individuals of a protected species from the population.	*Plants*: Short-term - Recovers in less than 1 year. Long-term - Takes more than 1 year to recover. *Animals*: Short-term - Recovers in less than 1 year. Long-term - Takes more than 1 year to recover.
Aquatic life	Aquatic life would not be affected or the effects would be at or below the level of detection and would not be measurable or of perceptible consequence to aquatic populations.	Effects to aquatic life would be measurable or perceptible, but localized within a small area. While the mortality of an individual animal might occur, the viability of the population would not be affected and the community, if left alone, would recover.	A change in aquatic life would occur over a relatively large area. The change would be readily measurable in terms of abundance, distribution, quantity or quality of population. Mitigation measures would be necessary to offset adverse effects, and they would likely be successful.	Effects to aquatic life would be readily apparent, and would substantially change populations over a large area in and out of the national park. Extensive mitigation would be needed to offset adverse effects, and its success could not be assured.	Short-term - Recovers in less than 1 year. Long-term - Takes more than 1 year to recover.

TABLE 3: DEFINITIONS OF IMPACT THRESHOLDS (CONTINUED)

Impact Topic	Impact Threshold Definition				Duration
	Negligible	Minor	Moderate	Major	
Vegetation	Individual native plants may occasionally be affected, but measurable or perceptible changes in plant community size, integrity, or continuity would not occur.	Effects to native plants would be measurable or perceptible, but would be localized within a small area. The viability of the plant community would not be affected and the community, if left alone, would recover.	A change would occur to the native plant community over a relatively large area that would be readily measurable in terms of abundance, distribution, quantity, or quality. Mitigation measures to offset/minimize adverse effects would be necessary and would likely be successful.	Effects to native plant communities would be readily apparent, and would substantially change vegetative community types over a large area, inside and outside the park. Extensive mitigation would be necessary to offset adverse effects and their success would not be assured.	Short-term - Recovers in less than 1 year. Long-term - Takes more than 1 year to recover.

TABLE 3: DEFINITIONS OF IMPACT THRESHOLDS (CONTINUED)

Impact Topic	Impact Threshold Definition				Duration
	Negligible	**Minor**	**Moderate**	**Major**	
Cultural resources	The effect is at the lowest levels of detection – barely perceptible and not measurable.	For archeological resources, the impact affects an archeological site(s) with modest data potential and no significant ties to a living community's cultural identity. The impact does not affect the character-defining features of a National Register of Historic Places-eligible or -listed structure, district, or cultural landscape.	For archeological resources, the impact affects an archeological site(s) with high data potential and no significant ties to a living community's cultural identity. For a National Register eligible or listed structure, district, or cultural landscape, the impact changes a character defining feature(s) of the resource but does not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized.	For archeological resources, the impact affects an archeological site(s) with exceptional data potential or that has significant ties to a living community's cultural identity. For a National Register-eligible or -listed structure, district, or cultural landscape, the impact changes a character defining feature(s) of the resource, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register.	Short-term - Effects on the natural elements of a cultural landscape may be comparatively short-term (e.g., 3 to 5 years) until new vegetation grows or historic plantings are restored. Long-term - Because most cultural resources are non-renewable, any effects on archeological, historic, or ethnographic resources, and on most elements of a cultural landscape, would be long-term.

TABLE 3: DEFINITIONS OF IMPACT THRESHOLDS (CONTINUED)

Impact Topic	Impact Threshold Definition				Duration
	Negligible	**Minor**	**Moderate**	**Major**	
Visitor use and experience	Visitors would not be affected, or changes in visitor use and/or experience would be below or at the level of detection. Any effects would be short-term. The visitor would not likely be aware of the effects associated with the alternative.	Changes in visitor use and/or experience would be detectable, although the changes would be slight. The visitor would be aware of the effects associated with the alternative, but the effects would be slight.	Changes in visitor use and/or experience would be readily apparent. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes.	Changes in visitor use and/or experience would be readily apparent and have important consequences. The visitor would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.	Short-term – Effects occur only during project implementation activities. Long-term – Effects extend beyond project implementation activities.
Park operations	Park operations would not be affected or the effect would be at or below the lower levels of detection, and would not have an appreciable effect on park operations.	The effect would be detectable but would be of a magnitude that would not have an appreciable adverse or beneficial effect on park operations. If mitigation were needed to offset adverse effects, it would be relatively simple and likely successful.	The effects would be readily apparent and would result in a substantial change in park operations in a manner noticeable to staff and the public. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.	The effects would be readily apparent and would result in a substantial change in park operations in a manner noticeable to staff and the public and be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed, would be extensive, and their success could not be guaranteed.	Short-term – Effects occur only during project implementation activities. Long-term – Effects extend beyond project implementation activities.

TABLE 4: COMPARISON OF IMPACTS OF THE ALTERNATIVES[1]

Impact Topic	Alternative A No Action/Continue Current Management	Alternative B Preferred Alternative
Public health and safety	Under the no action alternative, the remote possibility for visitors and staff to be exposed to untreated sewage would persist. The chance for exposure would occur only during collection system failure or during emergency shut down of the wastewater treatment plant. In addition, park staff would continue to be exposed to the dangers of using deteriorated catwalks and stairways to perform daily operations and routine maintenance at the wastewater treatment plant. These would yield minor, short- and long-term, adverse effects on public health and safety at Flamingo.	Replacing the wastewater treatment system serving Flamingo would provide increased protection from exposure to raw sewage. The new facility would better protect staff from on-the-job injury. However, risks would not be eliminated, and these improvements would result in short- and long-term, minor, beneficial effects on public health and safety. During construction activities, visitors and staff would be exposed to short-term, adverse effects of negligible intensity due to construction traffic and small-scale excavation.
Hydrology and water quality	Under this alternative, treated effluent would continue to be discharged into Eco Pond and slowly released into local groundwater. Because most groundwater movement from Eco Pond is to the south, it is unlikely that this alternative could detectably affect Outstanding Florida Waters, if there were any effects at all. Because nutrient loading to the environment beyond Eco Pond is very low, continuation of the no action alternative would result in localized, long-term, adverse effects to hydrology and water quality of negligible intensity.	Under the preferred alternative, treated effluent would continue to be discharged into Eco Pond, and released into local groundwater. The quantity of discharge would not change, but the quality of the water would be improved. Because more than 99 percent of groundwater movement from Eco Pond is to the south, and studies have shown that there is little or no groundwater-to-surface water interface except for the possibility of leakage through portions of the berm/levee, which is expected to be corrected through the installation of a barrier screen-- it is not expected that Outstanding Florida Waters will be impacted by this project. Nutrient loading to Eco Pond, and therefore to the surrounding groundwater would be lessened. The continued presence of Eco Pond would produce adverse environmental effects. However, the improved quality of the effluent discharged to the pond under the preferred alternative would produce long-term, beneficial effects of negligible intensity for local hydrology and water quality.

[1] Assume that all effects (impacts) are DIRECT unless otherwise stated

TABLE 4: COMPARISON OF IMPACTS OF THE ALTERNATIVES (CONTINUED)

Impact Topic	Alternative A No Action/Continue Current Management	Alternative B Preferred Alternative
Wetlands and floodplains	Continuation of the no action alternative would likely result in long-term, localized, negligible to minor, adverse effects to the adjacent wetland environment. Changes to the wetland could be occurring due to the input of nitrogen and phosphorus contained in infiltration waters from Eco Pond, but no specific effects have been measured. Wastewater collection and treatment components located within the floodplain would experience continued increased risk of inundation during hurricanes and tropical storms, resulting in long-term, minor, adverse effects on the floodplain of the project area. However, these effects cannot be completely avoided because all of Flamingo would be inundated during hurricane events.	Under the preferred alternative, the new wastewater system would produce beneficial impacts to wetlands and floodplains of Flamingo. The reduced nutrient levels within the treated effluent discharged under the preferred alternative would result in long-term beneficial effects to wetlands of negligible intensity. The preferred alternative provides for elevation of wastewater treatment facilities to the required 11 feet above sea level. This would better protect the system from flooding and service interruptions, which now occur approximately two times per year. This would result in long-term, minor, beneficial effects to the floodplain of the project area.
Wildlife	Long-term, minor, beneficial effects to wildlife related to the continued use of Eco Pond as a manmade habitat and source of freshwater would result from the no action alternative. Potential long-term, adverse effects of unknown consequences, due to the possibility of wildlife exposure to parasitic nematodes would also continue.	In addition to the effects discussed under the no action alternative, the preferred alternative would result in negligible to minor, short-term, adverse effects to wildlife associated with the construction and installation of the upgraded wastewater treatment plant. Wildlife would retreat from or avoid the project site during construction activities, but pre-existing conditions would return upon project completion.
Endangered, threatened, and protected species and critical habitats	The effects to endangered and threatened species under the no action alternative range from “no effect” to “may affect, not likely to adversely affect." The disturbance that could occur during cattail control at Eco Pond and during repair and maintenance of the wastewater collection system and force main would be small scale and of duration sufficient only to complete repairs.	The effects to endangered, threatened, and protected species under the preferred alternative range from “no effect” to “may affect, not likely to adversely affect." Additionally, there would be no adverse effects to the designated critical habitats of any of these species. Ongoing cattail management at Eco Pond would remain unchanged and is not likely to affect any listed species. The limited amount of surface disturbance, and the fact that excavation is restricted to previously disturbed and developed areas also reduces the potential for effects to threatened and endangered species.

TABLE 4: COMPARISON OF IMPACTS OF THE ALTERNATIVES (CONTINUED)

Impact Topic	Alternative A No Action/Continue Current Management	Alternative B Preferred Alternative
Aquatic life	The no action alternative would result in the continuation of current conditions including use of the lined lagoon as an artificial habitat. This creates the potential for contact with raw sewage, and is considered a long-term, adverse effect of unknown consequences. Eco Pond would also continue to be utilized as an artificial habitat, but would benefit wildlife by providing forage and interaction opportunities. This would be a minor, long-term, beneficial effect.	Same as the no action alternative.
Vegetation	Short- and long-term, adverse effects to vegetation resulting from the implementation of the no action alternative would range from negligible to minor, and would result from: the continued need for repairs to the collection system and effluent pipes, and continued nutrient loading from untreated graywater and sewage leaking from the collection system lines. It is unknown what levels of nutrients are being transferred from Eco Pond to adjacent vegetation.	Short-term, adverse effects to vegetation resulting from the implementation of the preferred alternative would range from negligible to minor and would be the result of ground disturbances associated with the construction and installation associated with the upgrading of the wastewater treatment plant and the rehabilitation of the collection system. A long-term, negligible to minor, beneficial effect to vegetation would result from the cessation of untreated graywater and sewage leaking from the collection lines, and a decrease in effluent nutrient levels entering Eco Pond.
Cultural resources	There are no known historic resources in the project area. Because there is no new excavation, the opportunity to locate previously unknown historic resources is eliminated. There would be no impacts to cultural resources as a result of implementation of the no action alternative.	Because all disturbance associated with the preferred alternative occurs on fill and in previously disturbed areas, it is unlikely that there would be detectable impacts on cultural resources as a result of implementation of this alternative.

TABLE 4: COMPARISON OF IMPACTS OF THE ALTERNATIVES (CONTINUED)

Impact Topic	Alternative A No Action/Continue Current Management	Alternative B Preferred Alternative
Visitor use and experience	The no action alternative would have a moderate, adverse effect on visitor use and experience due to the deteriorating condition of the existing wastewater treatment system and the resulting frequent toilet outages that would be expected to occur for both the short- and long-term. Continued and increasing maintenance activity associated with the repair of this deteriorating system would have a short- and long-term, moderate, adverse impact on the visitor experience because the collection lines and lift stations are within or visible from primary visitor use areas. The continued use of Eco Pond for effluent disposal would have a long-term, minor, beneficial effect by ensuring that this manmade pond continues to serve as a major visitor aquatic/wildlife viewing area.	The preferred alternative would have a short- and long-term, moderate beneficial effect on the visitor experience because the upgraded wastewater treatment system would generate less maintenance activity in visitor use areas and provide an effective, efficient, and reliable means of providing a basic need requirement to ensure a quality visitor experience. This alternative would have a short-term, minor, adverse effect on visitors during the construction of the upgraded wastewater plant due to the inconvenience of having to use portable toilets and the disruptions to the visitor experience caused by construction activities. The reduction of cattails (herbicide spraying) at Eco Pond would have a direct, long-term, minor, beneficial effect on the visitor experience by maintaining the open character of the pond, allowing unobstructed aquatic/wildlife viewing.
Park operations	The no action alternative would not result in any changes to existing negligible to moderate, short- and long-term, adverse effects to park operations, brought about by the over utilization of current staff, and the age and deteriorated state of the current system. These conditions would continue.	The preferred alternative would result in some short-term, negligible to minor, adverse effects to park operations related to the training of staff on the upgraded, more technically demanding system. Short- and long-term, minor to moderate, beneficial effects would be those associated with the removal and upgrade of the existing antiquated, maintenance-intensive system.

AFFECTED ENVIRONMENT, EVALUATION METHODOLOGY, AND ENVIRONMENTAL CONSEQUENCES

AFFECTED ENVIRONMENT

Detailed information on resources related to issues is identified prior to each impact topic analysis.

Park Description

Everglades National Park now encompasses 1,509,000 acres, comprising the southern tip of Florida (see Figure 1). The habitat has been described as a "river of grass" (Douglas 1947) that flows to the sea. The park contains an ecosystem that demonstrates the delicate balance within nature and the potential threats from human intervention. It is formed by a shallow river of freshwater 50 miles wide. The topography is so subdued that a broad sheet of water slowly flows over and through the porous limestone bedrock on its way to the sea, rather than following well-defined drainages. Most of the park is actually covered with water during normal wet seasons, while dry winters cause freshwater to dwindle to a few open areas that become crowded with wildlife. Twenty-one threatened and endangered animal species reside in the park, including the American crocodile *(Crocodylus acutus)*, Florida panther *(Felis concolor coryi)*, Eastern indigo snake *(Drymarchon corais couperi)*, mangrove fox squirrel *(Sciurus niger avicennia)*, West Indian manatee *(Trichechus manatus),* wood stork *(Mycteria americana)*, snail kite *(Rostrhamus sociabilis)*, and bald eagle *(Haliaeetus leucocephalus)*. The terrestrial and aquatic plant and animal communities have adapted to each other and to a climate of wet summers and dry winters. Although the park is often characterized as a sawgrass marsh, several distinct habitats exist within its boundaries, including: marine/estuarine; mangrove; coastal prairie; freshwater marl prairie; freshwater slough; cypress; hardwood hammock; and pineland. More than 350 bird species have been recorded, seven of which are rare or endangered.

Everglades National Park has the distinction of being a World Heritage Site and International Biosphere Reserve and is designated as a Ramsar Wetland of International Importance.

As a tourist destination drawing over one million visitors per year, the park is an important contributor to the economy of the local area. However, Everglades National Park is considered one of the most endangered national parks in the United States. A 93 percent drop in the population of wading birds nesting in the park, toxic levels of mercury found in all levels of the food chain, the die-off of seagrass in Florida Bay, and the number of endangered species are all indicators of the serious problems this park faces in the future. The declines are largely a result of problems with the quality, quantity, timing, and distribution of water throughout the Everglades.

Project Site Description

The project area is located in the Flamingo developed area at the southern end of the park (see Figures 1 and 2). The area is flat, with ground elevations generally three to eight feet above mean sea level. Shallow flooding occurs with heavy rains.

Flamingo is the largest developed area within Everglades National Park and receives over 150,000 visitors annually. The climate is hot and humid in the summer and mild in the winter. Rainfall averages 51 inches per year, with about 8 inches per month falling during the summer and 1 to 2 inches per month during the winter. Pan evaporation averages 64 inches a year. The project area is located between the two major watersheds of Everglades National Park. To the northwest lies Shark River Slough, which flows from the northeastern portion of the park and empties into the Gulf of Mexico. Taylor Slough, to the east, drains a small watershed and empties into northeastern Florida Bay.

The existing wastewater plant is located within the largest mangrove ecosystem in the Western Hemisphere.

The existing wastewater treatment plant, collection system, and effluent disposal system comprise approximately 660 acres and are within coastal prairie habitat, approximately 0.5 miles from the Florida Bay coastline.

See Appendix D for photographs depicting the proposed project area.

METHODOLOGY

General Evaluation Methodology

Overall, the National Park Service based these impact analyses and conclusions on the review of existing literature and Everglades National Park studies, information provided by experts within Everglades National Park and other agencies, professional judgments and park staff insights, the Florida State Historic Preservation Office, interested local tribes, and public input. For each impact topic, the analysis includes a brief description of the affected environment and an evaluation of effects. The impact analyses were based on professional judgment using information provided by park staff, relevant references and technical literature citations, and subject-matter experts.

The impact analyses involved the following steps:

- Identify the area that could be affected.
- Compare the area of potential effect with the resources that are present.
- Identify the intensity (negligible, minor, moderate, or major), context (local, parkwide, regional), duration (short- or long-term), and type (direct or indirect) of effect, both as a result of this action and from a cumulative effects perspective. Identify whether effects would be beneficial or adverse. The criteria used to define the intensity of impacts associated with the analyses are presented in Table 3.
- Impact analyses include implementation of mitigation measures taken to protect resources. Examples of these measures are outlined in Table 2.

General Definitions

The following definitions were used to evaluate the context, intensity, duration, and cumulative nature of impacts associated with project alternatives:

Context is the setting in which an impact is analyzed, such as local, parkwide, or region. CEQ requires that impact analyses include discussions of context.

Impact Intensity- Refer to Table 3 for complete descriptions of impact intensities used to assess effects for this analysis.

Duration

The duration of the impacts in this analysis is defined as follows:

- short term - when impacts occur only during construction or last less than one year; or
- long term - impacts that last longer than one year.

Direct versus Indirect Impacts

The following definitions of direct and indirect impacts were used in this evaluation:

- direct - an effect that is caused by an action and occurs at the same time and place.
- indirect - an effect that is caused by an action but is later in time, or farther removed in distance, but still reasonably foreseeable.

Cultural Resource Analysis Method

Impacts to cultural resources are described in terms of type, context, duration, and intensity, as described above, which is consistent with the regulations of the Council on Environmental Quality (CEQ 1978) that implement the National Environmental Policy Act. These impact analyses also are intended to comply with the requirements of both the National Environmental Policy Act and Section 106 of the National Historic Preservation Act. In accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 of the National Historic Preservation Act (36 CFR Part 800, Protection of Historic Properties), impacts to cultural resources were identified and evaluated by:

- Determining the area of potential effects
- Identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed in the National Register of Historic Places
- Applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register
- Considering ways to avoid, minimize, or mitigate adverse effects

Under the Advisory Council's regulations, a determination of either *adverse effect* or *no adverse effect* must also be made for affected cultural resources. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualify it for inclusion in the National Register. For example, this could include diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the alternative that would occur later in time, be farther removed in distance, or be cumulative (36 CFR Part 800.5, *Assessment of Adverse Effects*). A determination of no adverse effect means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the National Register.

The Council on Environmental Quality regulations (CEQ 1978) and *Director's Order #12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making* (NPS 2001a) call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, such as reducing the intensity of an impact from major to moderate or minor. Any resulting reduction in intensity of impact because of mitigation, however, is an estimate of the effectiveness of mitigation under the National Environmental Policy Act only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Although adverse effects under Section 106 may be mitigated, the effect remains adverse.

A Section 106 summary is included in the impact analysis for cultural resources. The summary is intended to meet the requirements of Section 106 and is an assessment of the effect of implementing the alternative on cultural resources, based on the criterion of effect and criteria of adverse effect found in the Advisory Council's regulations.

Cumulative Effects Analysis Method

The Council on Environmental Quality (CEQ 1978) regulations for implementing the National Environmental Policy Act require assessment of cumulative effects in the decision-making process for federal projects. Cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects are considered for both the no action and proposed action alternatives.

Cumulative impacts are considered for all alternatives and are presented at the end of each impact topic discussion analysis.

Cumulative effects were determined by combining the effects of the alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other past, ongoing, or reasonably foreseeable future actions at Everglades National Park and in the area surrounding Flamingo. Other actions that have the potential to have a cumulative effect in conjunction with this project include:

- Any development actions by the National Park Service in the park
- Resource development on both public and private lands in the vicinity, such as agriculture, urban development, and other activities that could adversely affect hydrology and surface water quality

Impairment Analysis Method

In addition to determining the environmental consequences of the preferred and other alternatives, the 2001 National Park Service Management Policies and Director's Order #12 (NPS 2001a) require analysis of potential effects to determine if actions would impair Everglades National Park resources.

The fundamental purpose of the National Park Service, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid or minimize to the greatest degree practicable adverse impacts on park resources and values. However, the laws do give National Park Service management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given National Park Service management discretion to allow certain impacts within parks, that discretion is limited by statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute an impairment. However, an impact would more likely constitute an impairment to the extent it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park or
- Identified as a goal in the park's Master Plan or General Management Plan or other relevant NPS planning documents

Impairment may result from National Park Service activities in managing the park, visitor activities or from activities undertaken by concessioner, contractors, and others operating in the park. A determination of impairment is made for each impact topic within each "Conclusion" section of this environmental assessment under "Environmental Consequences."

PUBLIC HEALTH AND SAFETY

Affected Environment

Approximately 150,000 visitors come to Flamingo each year. The wastewater collection and treatment facility process sewage generated by visitors, concessioner, and approximately 235 park staff residing at Flamingo. The plant, permitted for up to

90,000 gallons per day, discharges into Eco Pond and supports sanitation needs for the developed Flamingo area including the housing and maintenance area, marina, restaurant, laundry, and camping facilities. One purpose of the wastewater system improvement project is to provide a reliable wastewater treatment system that meets all present and future federal, state, and local effluent discharge standards.

The effluent discharged to Eco Pond has not consistently met the nitrate requirements of the Florida Department of Environmental Protection operating permit for treated effluent (see "Hydrology and Water Quality" section for a more complete discussion of water quality issues). Groundwater monitoring around Eco Pond however, has shown that nitrate levels are acceptably low. Further, the current effluent has consistently met existing permit criteria for bacteria (fecal coliform), biochemical oxygen demand (BOD), and total suspended solids. There have been no reports of visitors coming into contact with raw sewage at Flamingo.

Impacts of Alternative A: No Action / Continue Current Management

The wastewater treatment system components are located within the 100-year floodplain. (This is true of all the facilities at Flamingo – see the "Wetlands and Floodplains" section.) The existing generator/office building does not meet the state floodplain elevation requirement of 11 feet. The facility is subject to flooding from storm surge and during severe rain events. During high water, the lift stations become inundated and this may result in raw sewage being present on the surface within the Flamingo developed area. In addition, the treatment plant itself is subject to flooding. When the plant is inundated, wastewater processing shuts down, and untreated sewage is diverted to the adjacent one million gallon, lined lagoon. The emergency holding lagoon is at ground level, and in the event of large storms, raw sewage may overtop the berm and enter the surrounding area. Lift station inundation or plant shutdown occur approximately two times each year. The potential for visitors to be exposed to untreated effluent is low. However, in the event that exposure did occur, this would result in short-term, minor, adverse effects on public health and safety.

Elevated catwalks and stairways provide access to treatment facilities. These access routes are aging and in need of repair. Staff at the treatment plant must use these walkways to perform daily plant operations as well as routine maintenance. The deteriorated condition of these access routes exposes park staff to risk. This results in short- and long-term, minor adverse effects on public health and safety at Flamingo.

Cumulative effects. Visitors and staff at Flamingo are exposed to a variety of risks associated with the subtropical environment. Backcountry hiking in areas with few services, interactions with wildlife, and boating activities can all expose visitors to risk. Such risks would not be affected by the no action alternative. However, the park is planning to realign the Flamingo road system and install a new potable water treatment system in the near future. Such infrastructure improvements would produce short-term, adverse effects during construction activities. Over the long-term, these projects would contribute beneficially to public health and safety by ensuring a safe and reliable drinking water system is in place, and by improving travel conditions. Continued use of the existing wastewater treatment system would not contribute to the beneficial effects of other park plans and projects.

Conclusion. Under the no action alternative, the potential for visitors and staff to be exposed to raw sewage would persist. In addition, park staff would continue to be exposed to the dangers of using deteriorated access routes to perform daily operations and routine maintenance at the wastewater treatment plant. These would yield minor, short- and long-term, adverse effects on public health and safety at Flamingo.

Impacts of Alternative B: The Preferred Alternative

Under the preferred alternative, the new generator/office building and tankage would be constructed and rehabilitated, respectively, to meet the 11-foot elevation requirement. This would reduce the likelihood that surge or storm events would inundate the facilities, causing shutdown and the potential release of raw sewage to the environment. This would reduce the potential for visitors and staff to be exposed to potential pathogens present in untreated sewage. This would result in short- and long-term minor beneficial effects to public health and safety.

The upgraded facility would include new access routes to the wastewater treatment components. These new catwalks and stairways would be designed to meet current safety standards and would provide protection for staff from walkway failure and slip-and-fall accidents. Risks posed by using these walkways would not be eliminated, but reduced under the preferred alternative. This would result in short- and long-term, minor, beneficial effects to the health and safety of staff at Flamingo.

During project construction, a limited amount of disturbance would occur in the Flamingo developed area. Necessary safety precautions would be implemented to protect the public from any risk posed by construction equipment and small-scale excavation. This would result in short term, negligible adverse effects on public health and safety that would persist only during the construction period.

Cumulative effects. The risks associated with recreation in the subtropical environment would not be changed under the preferred alternative. Other park plans for construction, such as the water treatment plant upgrade and realignment of the Flamingo road, would also result in short-term, adverse effects to public health and safety. However, completion of the new water treatment system and Flamingo road realignment will enhance public health and safety. In concert with these other plans and projects, completion of the new wastewater treatment system would provide a modest reduction of risks to public health and safety.

Conclusion. Rehabilitation of the wastewater treatment system serving Flamingo would provide increased protection from exposure to raw sewage. The new facility would replace deteriorated catwalks and stairways and better protect staff from on-the-job injury. However, risks would not be eliminated, and these improvements would result in short- and long-term, minor, beneficial effects on public health and safety. During construction activities, visitors and staff would be exposed to short-term, adverse effects of negligible intensity due to construction traffic and small-scale excavation.

HYDROLOGY AND WATER QUALITY

Affected Environment

Water management is the critical issue for the Everglades. Development and upstream agriculture have dramatically changed the Everglades' water regime. Disruptions in the ebb and flow of water that supplies the "river of grass" have had significant impacts. By the mid-1800s, the Everglades was viewed as an unproductive swamp. Large-scale flood control and reclamation measures were undertaken to permit agriculture and development of the former marshland. The flows that once fed this unique system are now dramatically diminished by a network of canals, levees, and water control structures (Carter 2001). Much of the freshwater that once flowed here is now used in agriculture and urban areas. Experts now believe that the Everglades receive too little water during the dry season and too much during the rainy season. At times the water control structures at the park boundary are closed, restricting flows during historical flood season. Or alternatively, water control structures are opened and unnatural floodwaters occur during historically dry times (NPS 1997).

Regional Surface Waters

Historically, a portion of south Florida's freshwater supply came from the Kissimmee River basin, north of Lake Okeechobee. During the rainy season, the lake would overflow its shallow southern shore. This flow traveled slowly as a shallow river, 50 miles wide and 100 miles long, through the Everglades and into the coastal estuaries of Florida Bay and the Gulf of Mexico (Figure 4). The wetlands of the Everglades retain water, recharge aquifers, and form a mosaic of ponds, sloughs, sawgrass marshes, hardwood hammocks, tree islands, and forested uplands. In and around the estuaries, freshwater mingles with salt to create habitats supporting mangroves and nurseries for wading birds and fish. (Working Group of the South Florida Ecosystem Restoration Task Force 1998).

The wet season begins with May thunderstorms. In the summer, natural areas are almost completely covered with water. During the dry season (December to April), water levels gradually drop. The winter landscape is dotted with pools of water. Everglades plants and animals are adapted to alternating wet and dry seasons (NPS 1997).

Regional Groundwater

The aquifers that underlie south Florida are made mostly of limestone and other carbonate rocks. These formations tend to dissolve over time in water, making them porous. Groundwater travels relatively quickly through these formations. These open aquifers are said to be "unconfined" and are recharged by fresh surface water flows (USGS 2001).

The seasonality of water availability in the Everglades has created an interplay of surface water and groundwater. During the summer rainy season, increased overland flow and stream flows recharge aquifers near the surface. During the dry winter, these superficial aquifers supply groundwater to support stream flows and provide vital moisture for wetlands and marshes.

Regional Water Quality

The Everglades are also affected by degraded water quality. Pollutants from urban areas and agricultural runoff, including phosphorous and nitrogen, metals, and pesticides, have negatively affected water quality, native vegetation, and animal populations. Agricultural nutrients entering the Everglades have caused a decline in native plant species and an overabundance of nuisance species. In park waters these excess nutrients destroy mats of algae called periphyton. These algae are the primary producers in the Everglades food web, providing both food and oxygen for small aquatic organisms. In the dry season, these algal mats also provide the critical moisture that enables many small organisms to survive the long months until rains come again (NPS 1997, Carter 2001).

Mercury pollution is a growing problem, and the source of this pollutant is largely atmospheric. In 1989, elevated levels were first detected in Everglades freshwater fish. Mercury occurs in the natural environment, but when converted to its organic form by sediment microbes, it is a dangerous contaminant. Tests have shown that the park's raccoons and alligators also contain elevated levels of this toxic metal in their systems. An endangered Florida panther, found dead in 1989, contained mercury concentrations that would be lethal to humans (NPS 1997).

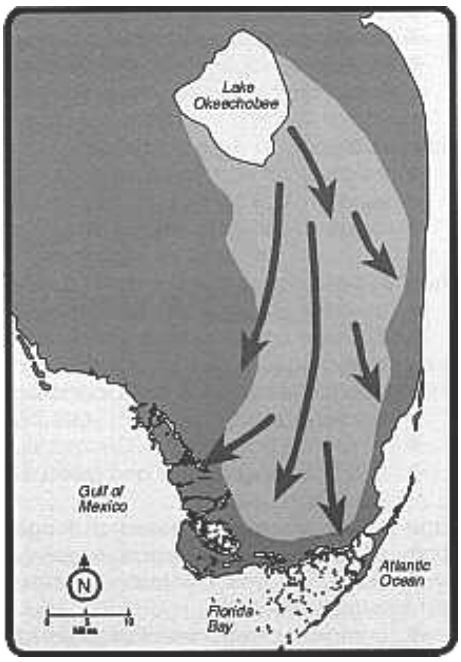


Figure 4: Historic Freshwater Flows through the Everglades

Everglades Restoration Efforts

In response to public concern about development and continued ecosystem degradation, all levels of government have organized efforts to work towards a balanced and sustainable south Florida ecosystem. Several environmental and growth management laws have been passed in an attempt to address the needs of Everglades ecosystem restoration. Restoring and maintaining, at least in part, the natural hydrologic regimen of the area is the most vital component of all restoration efforts.

The South Florida Ecosystem Restoration Task Force was formalized by Congress in the Water Resources Development Act of 1996. Membership includes federal, state, local and tribal governments. The task force coordinates over 200 projects that are part of restoring the south Florida ecosystem. The task force uses three goals: 1) get the water right; 2) restore, preserve, and protect natural habitats and species; and 3) foster compatibility of built and natural systems. The Department of the Interior, which chairs the Task Force, uses the Comprehensive Everglades Restoration Plan as the principal mechanism for restoring natural hydrologic functions and for providing water supplies (Central and South Florida Comprehensive Plan, undated; NPS 1997).

The National Park Service actively pursues ecosystem restoration efforts, both within the park and at the regional level. NPS park staff are involved in establishing restoration goals, evaluating projects, conducting scientific research, and monitoring field conditions to measure progress (NPS 1997).

Project Area

The Flamingo area is located between the outlets of the two major watersheds of Everglades National Park – Shark River Slough to the northwest and Taylor Slough to the east. Shark River Slough flows from its headwaters in the extreme northeastern part of the park and empties into the Gulf of Mexico in the Ten Thousand Islands area. Taylor Slough drains a much smaller watershed and flows into northeastern Florida Bay (Aumen 2002).

Flamingo is the site of infrastructure development (including roads, electricity transmission, and water/wastewater facilities), visitor services and concessions, and park housing and operations. The whole area has largely been disturbed by past development, and all structures are built on imported fill. These human interventions have, to a degree, interfered with the natural water flow and hydrology regimen of the immediate vicinity.

Eco Pond, the percolation pond for the existing Flamingo wastewater treatment plant, is located approximately 1,060 feet north of Florida Bay. The nearest open freshwater lies approximately one mile north of the pond at Bear and Mud Lakes. Eco Pond is a 10-acre artificial pond constructed to discharge treated effluent into groundwater via percolation. The pond environment is an artificial freshwater system, vegetated by cattails and visited by

many wildlife species. In the south Florida environment, evaporation is approximately equal to rainfall (Jordan, Jones & Goulding 1995), so for the purposes of this analysis, infiltration is assumed to be equivalent to the effluent discharged to Eco Pond. Evaluation of the hydrology of Eco Pond site indicates that flow from the pond will largely be carried southward into Florida Bay (Jaffe *et al.* 2001; Jordan, Jones & Goulding 1995). Recently, Miralles-Wilhelm (2002) estimated that less than two percent of water infiltrating from Eco Pond would move northward.

The Flamingo developed area is within coastal prairie habitat. Elevations in the developed area are slightly higher than those of the surrounding wetlands, ranging from approximately 4 to 7 feet above sea level. This area is not subject to the overland flows of surface water that define the Everglades wetland system.

During dry conditions, depressional areas are evident immediately to the north of the pond, in the opposite direction from Florida Bay. These depressions contain freshwater during the wet season, as evidenced by their vegetation patterns and low elevation.

Summary of Water Quality Regulations Relative to the Proposed Project

Currently, the Florida Department of Environmental Protection regulates effluent quality from wastewater treatment systems by setting criteria for discharges. Included in the criteria are biochemical oxygen demand, total suspended solids, nitrates, fecal coliform, and pH. There currently is no defined limit for phosphorus content in plant effluent. The Flamingo wastewater treatment plant has consistently met the state requirements for all tested parameters except nitrates. The permitted nitrate limit is 12 parts per million. Effluent released into Eco Pond sometimes reaches 15 parts per million.

Beginning in 2010, the Florida Department of Environmental Protection will enforce new, stricter water quality parameters for treated effluent. These standards, commonly referred to as 10-10-10-1, represent 10 parts per million biochemical oxygen demand, 10 parts per million total suspended solids, 10 parts per million total nitrogen, and 1 part per million total phosphorus. Improvements will be needed at the wastewater treatment plant to meet these parameters. Presently, the wastewater treatment plant does not treat for phosphorus, and discharge levels generally range from 4 to 5 parts per million.

Other regulations may play an important role in management of future discharges into Eco Pond. Outstanding Florida Water standards designate surface waters within the park worthy of increased protection, and no degradation of water quality is allowed. The water quality to be maintained in Outstanding Florida Waters (OFW) is determined based on water quality that existed one year prior to designation (1978-1979), or in the absence of data, by application of best scientific analysis to estimate those parameters. During the rainy season, there are surface waters to the north of Eco Pond that are considered OFW. There are no baseline water quality data currently available for the OFW.

In 2001, Jaffe *et al.* estimated that Eco Pond contributes approximately 100 kilograms (220 pounds) of total phosphorus to the surrounding groundwater each year. Given that no more than one percent of this would move northward, as groundwater, toward Outstanding Florida Waters there is unlikely to be detectable or quantifiable effects of this input to OFW. As phosphorus moves with groundwater, it will be utilized by plants as a nutrient, and will adhere to soil particles. These factors will also serve to reduce the possibility that phosphorus will measurably affect OFW near the project area.

Impacts of Alternative A: No Action / Continue Current Management

Under the no action alternative, Eco Pond would continue to serve as groundwater discharge for treated effluent. Eco Pond is permitted by the state of Florida to serve as a

percolation pond, delivering the discharge to groundwater. Vegetation in such constructed ponds has been shown to be efficient in removing nutrients and other contaminants from the discharged effluent (Novotny 1994). Jaffe *et al.* (2001) estimated that only approximately 100 kilograms (220 pounds) per year of phosphorus are contributed to local groundwater by Eco Pond. The recent transect study addendum (see Appendix H) has shown the possibility that Eco Pond may be leaking laterally through the levee towards the north. Although extensive groundwater quality assessment has not been performed near Eco Pond, changes in vegetation outside the berm have not been noted despite more than 3 decades of operation at total phosphorus levels in plant effluent in the 4-5 parts per million range. In the absence of historic water quality monitoring data, the effects of Eco Pond on the quality of local surface waters to the north can only be estimated. Given the low delivery rate of phosphorus, and the dominant movement of groundwater to the south, any effects to surface waters are anticipated to be highly localized, long-term and adverse, but of negligible to minor intensity.

Because of the possibility that Eco Pond may generate a low level of localized environmental effects, there remain regulatory compliance issues that must be addressed. Steps must be taken to eliminate any potential connection between discharges into Eco Pond, and surface waters (Outstanding Florida Waters) to the north of the pond. In that regard, studies are underway to determine the existence of any such connection. Since completed studies indicate that such connection is unlikely, or not quantifiable through an underground route, and that a potential may exist for seepage through the Eco Pond berm/levee, further studies will focus on the integrity of the berm. In the event any seepage is discovered, a barrier curtain will be installed to negate any resulting groundwater to surface water connection.

Cumulative effects. The disruptions to groundwater flow and surface hydrology that have altered the Everglades are caused by large-scale diversion projects. Regional water quality has been affected by upstream agriculture and urban development. Under the no action alternative, the continued presence of the artificial freshwater environment at Eco Pond, and the addition of a small amount of nutrient loading to local groundwater would add to long-term, adverse, cumulative effects, but the contribution would be negligible.

The park is planning two other projects that would soon occur in the project area – realignment of the Flamingo road, and installation of a new potable water treatment system. The road realignment would not likely affect hydrology or water quality, outside temporary sediment releases during construction. The new water treatment system will eliminate withdrawals from freshwater aquifers, and have a modest beneficial effect on local hydrology. In concert with these plans, the no action alternative would contribute to long-term, adverse effects on hydrology and water quality at a negligible level.

Conclusion. Under this alternative, treated effluent would continue to be discharged into Eco Pond and released into groundwater. Studies indicate, however, that the minimal amount of groundwater that flows toward the Outstanding Florida Waters to the north of Eco Pond has little or no interface with the surface waters, and that there are no impacts to Outstanding Florida Waters. In the event lateral leakage through the Eco Pond levee is discovered, improvements to the levee will be accomplished in this project to negate any such flow. Therefore, continuation of the no action alternative, including repairs if necessary to Eco Pond levee, would have negligible adverse effects to hydrology and water quality.

Alternative A would not produce major adverse impacts on hydrology and water quality or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the

park, or (3) identified as a goal in the park's Master Plan or other National Park Service planning documents. Consequently, there would be no impairment of hydrology and water quality or values as a result of the implementation of Alternative A.

Impacts of Alternative B: The Preferred Alternative

Under the preferred alternative, Eco Pond would continue to serve as groundwater discharge for treated effluent. The volume of effluent to be released to Eco Pond would not change (permitted 90,000 gallons per day), but the quality of the discharge would be improved dramatically. This improvement would represent a beneficial effect compared to the no action alternative.

The planned wastewater treatment facility would reduce the nitrogen and phosphorus content of effluent to meet or exceed 2010 Florida Department of Environmental Protection (FDEP) requirements. The maximum allowable level of nutrients in the discharge would be 10 parts per million total nitrogen and 1 part per million total phosphorus. By reducing the nutrient load in the discharged effluent to less than 2 percent of current levels, groundwater leaving Eco Pond will have even fewer effects on the environment.

Cumulative effects. The disruptions to groundwater flow and surface hydrology that have altered the Everglades are caused by large-scale diversion projects. Regional water quality has been affected by upstream agriculture and urban development. Under the preferred alternative, the continued presence of the artificial freshwater environment at Eco Pond, and the addition of a small amount of nutrient loading to local groundwater would add to long-term, adverse, cumulative effects, but the contribution would be negligible.

The park is planning two other projects that would soon occur in the project area – realignment of the Flamingo road, and installation of a new water treatment system. The road realignment would not likely affect hydrology or water quality, outside temporary sediment releases during construction. The new water treatment system will eliminate withdrawals from freshwater aquifers, and have a modest beneficial effect on local hydrology. In concert with these plans, the preferred alternative would contribute to long-term, adverse effects on hydrology and water quality at a negligible level.

Conclusion. Under the preferred alternative, treated effluent would continue to be discharged into Eco Pond, and released into local groundwater. The quantity of discharge would not change, but the quality of the water would be improved. Because more than 99 percent of groundwater movement from Eco Pond is to the south, and studies have shown that there is little or no groundwater-to-surface water interface, Outstanding Florida Waters are not considered to be impacted. Nutrient loading to Eco Pond, and therefore to the surrounding groundwater would be lessened.

The continued presence of Eco Pond would produce adverse environmental effects. However, the improved quality of the effluent discharged to the pond under the preferred alternative would produce long-term, beneficial effects of negligible intensity for local hydrology and water quality.

As with Alternative A, the possibility of lateral leakage through the levee at Eco Pond will be investigated and if confirmed, actions will be taken to correct this leakage to prevent impact to surface waters (Outstanding Florida Waters).

Alternative B would not produce major adverse impacts on hydrology and water quality or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's Master Plan or other National Park Service planning documents. Consequently, there would be no impairment of hydrological and

water quality resources or values as a result of the implementation of Alternative B.

WETLANDS AND FLOODPLAINS

Affected Environment

The Flamingo area lies within the 100-year floodplain of hurricanes and tropical storms that occur in Florida Bay to the south, and is surrounded by the wetland habitats of the Everglades and coastal estuary. The hydrology of the Flamingo area is described in greater detail in the "Hydrology and Water Quality" section of this document.

Wetlands

The project area is contained within the previously disturbed and developed areas of Flamingo. The sites of wastewater collection and treatment are located on previously excavated and filled lands. None of the components of the collection and treatment system are located within the wetland habitats that are present immediate beyond the Flamingo developed area. Eco Pond is an artificially constructed percolation pond designed to retain treated wastewater and allow natural biological and physical processes to complete the treatment process. The 90,000 gallons per day of effluent that can be discharged into Eco Pond percolates into the surrounding groundwater, and joins the hydrologic system of the area.

Recent hydrologic evaluation of Eco Pond (Miralles-Wilhelm 2002) indicates that the vast majority of percolation from Eco Pond migrates southward toward Florida Bay. The distance from the pond to the bay is 1,060 feet. The study found that less than two percent of the percolating water would migrate as groundwater northward toward Outstanding Florida Waters. These recent findings are consistent with those presented by Camp Dresser & McKee, Inc. (2002a) and Jordan, James & Goulding (1995).

The National Park Service has directed park staff to protect wetlands from adverse impacts wherever practicable (Director's Order 77-1). The NPS must avoid direct or indirect adverse impacts on wetlands, or where impacts cannot be avoided, degradation or loss must be minimized by every practicable effort. Any actions that may reduce or degrade wetlands are governed by the Clean Water Act and Rivers and Harbors Act (33 US Code Parts 1344 and 403, respectively) and are regulated by the U.S. Army Corps of Engineers and the Environmental Protection Agency.

Floodplains

The Flamingo area lies at an elevation of less than 10 feet above sea level. There is little change in topography across the project area. The wastewater treatment building site is located at approximately five to seven feet in elevation. Eco Pond, the collection system, and effluent transmission piping are also located within the coastal zone 100-year floodplain. This area would likely be inundated by floodwater in the event of a hurricane or major tropical storm. Facilities located in these coastal high-hazard areas are required to meet Monroe County floodplain management standards.

Since the establishment of Everglades National Park in 1947, the park's mission has been to preserve resources inclusive of hydrological conditions within the park and the south Florida ecosystem. Subsequent agricultural and residential development surrounding the park has increased over the years and substantially changed the hydrology. South Florida's infrastructure of canals, levees and water control structures were built to control flooding and move water through agricultural and developed areas.

The Statement of Findings for Executive Order 11988 "Floodplain Management" is attached in Appendix A of this document.

Impacts of Alternative A: No Action / Continue Current Management

Wetlands

Under the no action alternative, effluent exceeding the plant operating permit limit for nitrates would continue to be discharged into Eco Pond. However, groundwater monitoring outside the pond berm has shown that elevated nutrient levels based on current standards are not present. In addition, only a small fraction of the percolating water migrates northward, as groundwater, toward wetland environments. Vegetation transects and comprehensive water quality analyses have not been performed to date in the areas north of the pond. With only a portion of the information needed to thoroughly evaluate the potential effects to local wetlands, overall effects to wetlands can only be estimated. Continuation of the no action alternative would likely result in long-term, adverse effects to wetlands of negligible to minor intensity.

Utilization of the existing wastewater treatment systems, including the one million gallon holding lagoon, would continue. The presence of the facilities is not likely to affect wetlands, as they are located in previously excavated and filled areas.

Floodplains

The existing facilities at Flamingo are located in the 100-year floodplain out of necessity. There are no sites in this area that would not be subject to flooding during hurricanes or large tropical storm events. The existing wastewater collection and treatment system is subject to inundation and flooding during high water events. Approximately twice each year, high water events force closure of the wastewater treatment plant and interruption of the treatment process. If flooded the possibility exists for raw sewage to be introduced into the environment. This increased exposure to flood risk represents a long-term, minor, adverse effect on the floodplain of the project area.

Cumulative effects. Under current management, the existing wastewater collection and treatment system would contribute to adverse effects on wetlands and floodplains in south Florida. Because regional impacts to wetlands have been due to large-scale water control projects and the presence of agriculture north of the park, the contribution of the existing wastewater treatment system would be negligible. Urban development in south Florida has resulted in construction of many facilities and communities within the 100-year floodplain. In view of this trend, the contribution of the existing Flamingo water treatment system to floodplain effects would also be minimal.

Other plans for the Flamingo area include realignment of the road and installation of a new water treatment system. Neither of these projects would increase impervious areas of the floodplains or affect the wetlands surrounding the Flamingo area. The no action alternative, in combination with other development plans at Flamingo, would contribute negligibly to adverse cumulative effects on regional wetlands and floodplains.

Conclusion. Continuation of the no action alternative would likely result in long-term, localized, negligible to minor, adverse effects to the adjacent wetland environment. Changes to the wetland could be due to the input of nitrogen and phosphorus contained in percolating waters from Eco Pond, but no specific effects have been measured.

Wastewater collection and treatment components located within the floodplain would experience continued increased risk of inundation during hurricanes and tropical storms, resulting in long-term, minor, adverse effects on the floodplain of the project area. However, these effects cannot be completely avoided, because all of Flamingo would be inundated during hurricane events.

Alternative A would not produce major adverse impacts on wetland or floodplain resources whose conservation is (1) necessary to fulfill specific purposes identified in the

establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's Master Plan or other National Park Service planning documents. Consequently, there would be no impairment of wetland or floodplain resources as a result of the implementation of Alternative A.

Impacts of Alternative B: The Preferred Alternative

Wetlands

Under the preferred alternative, Eco Pond would continue to be used as a percolation pond for discharge of treated effluent. The new wastewater treatment facility would produce effluent lower in nitrogen and phosphorus. The standards to be met by the new facility include reducing total nitrogen to 10 parts per million and total phosphorus to 1 part per million. This would meet the more stringent criteria required by the Florida Department of Environmental Protection for the year 2010. Because the water that percolates from Eco Pond generally travels south to Florida Bay, the changes that improved effluent quality may make on wetlands to the north would be difficult to measure. The continued presence of Eco Pond would produce adverse environmental effects. However, the greatly reduced nutrient levels in the treated effluent discharged under the preferred alternative would result in long-term beneficial effects to wetlands of negligible intensity.

Floodplains

Under the preferred alternative, the risk of flooding wastewater treatment system components is reduced by elevating the facilities. The generator/office building and the treatment system tankage would be raised to 11 feet above sea level. This would meet minimum floodplain requirements for the area. By reducing the chance for inundation, fewer interruptions in service would result, and system reliability would improve. As a result there would be minor, short- and long-term, relative beneficial effects to the floodplain of the Flamingo area.

Cumulative effects. Under the preferred alternative the upgraded wastewater treatment system would provide relative benefits for the wetlands and floodplains in south Florida. Because regional impacts to wetlands have been due to large-scale water control projects and the presence of agriculture north of the park, the contribution of the upgraded wastewater treatment system in reducing nitrogen and phosphorus in the effluent discharge would be negligible. Urban development in south Florida has resulted in the presence of many facilities and communities within the 100-year floodplain. The upgraded wastewater treatment facilities would make no detectable contributions to regional effects.

The park also plans to realign the Flamingo road system and install a new potable water treatment system. Neither of these projects would increase impervious areas of the floodplains or affect the wetlands surrounding the Flamingo area. The preferred alternative, in combination with other development plans at Flamingo, would not contribute to cumulative effects on regional wetlands and floodplains.

Conclusion. Under the preferred alternative, the new wastewater system would provide beneficial impacts to wetlands and floodplains of Flamingo. The reduced nutrient levels within the treated effluent discharged under the preferred alternative would result in long-term beneficial effects to wetlands of negligible intensity.

The preferred alternative provides for elevation of wastewater treatment facilities to the required 11 feet above sea level. Raising these structures is a coastal flood requirement, and is expected to protect the facilities from storm surges. This would result in long-term, minor, beneficial effects to the floodplain of the project area.

Alternative B would not produce major adverse impacts on wetland or floodplain resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's master plan or other National Park Service planning documents. Consequently, there would be no impairment of wetland or floodplain resources as a result of the implementation of alternative B.

WILDLIFE AND WILDLIFE HABITATS

Affected Environment

The warm wet climate, abundant vegetation, and unique habitats found within Everglades National Park support over 40 species of mammals, 347 species of birds, 50 species of reptiles (including 27 snakes and 16 turtles), and 15 species of amphibians. Only a portion of these species commonly occur in habitats present within the project area. These habitats consist mainly of the coastal prairie in the Flamingo area, Florida Bay, and to a lesser extent mangrove stands and salt marshes interspersed throughout the area. For a more detailed description of the vegetative habitats within the affected environment refer to the "Vegetation" section.

Species associated with or commonly observed in these habitats are included in Table 5.

Special Use Within the Project Area.

Flamingo Wastewater Treatment Plant site. The lined sewage lagoon at the site is an artificial habitat and represents an "attractive nuisance" (potentially harmful since wildlife tend to be drawn to it). American alligators frequently dig under the surrounding fence and bask on the black lining. Wading and shore birds have also been observed within the fenced area of the lagoon. Depending on the time and the year, coot (*Fulica americana),* osprey (*Pandion haliaetus)*, white-crowned pigeon (*Columba leucocephala)*, warblers (*Dendroica* species), red-shouldered hawk *(Buteo lineatus)*, anhinga (*Anhinga anhinga)*, sora rail (*Porzana carolina)*, a variety of shorebirds including killdeer *(Charadrius vociferous)* and avocet (*Recurvirostra americana)*, and other transient species may be present in and adjacent to the wastewater treatment plant site (Snow 2002).

Eco Pond. As the only freshwater source available in the greater Flamingo area, Eco Pond attracts large populations of wading and shore birds, ducks, and the occasional raptor (mainly osprey or bald eagle). The pond also provides a source of drinking water and forage opportunity for a variety of mammals and reptiles (see Table 5). Eco Pond also represents an enhanced nutrient source when compared to the surrounding ecosystem. This means that nitrogen or phosphorus dependant plant species, like the cattail (and wildlife species dependant on them), occur here and nowhere else in the immediate area.

In other areas of Florida, fish in wastewater percolation ponds have been found to be infected with the nematode *Eustrongylidosis* which in turn infect wading birds that prey on the fish. Infected fish have not been found in Eco Pond, but wading bird nestlings at Frank Key in Florida Bay have tested positive where the rest of Florida Bay was negative. Eco Pond seemed to be the most likely source of infection. However, it takes less than one percent of positive fish to cause problems in nearby colonies, making detection difficult (Spalding *et al.* 1993, Spalding *et al.* pers. comm).

TABLE 5: WILDLIFE COMMON WITHIN THE AREA OF ANALYSIS

Common Name	Scientific Name
Mammals	
Opossum	*Didelphis marsupialis*
Raccoon	*Procyon lotor*
Bobcat	*Lynx rufus*
Rabbit	*Sylvilagus* sp.
Birds	
Brown pelican	*Pelecanus occidentalis*
Double-crested cormorant	*Phalacrocorax auritus*
Great blue heron	*Ardea herodias*
Snowy egret	*Egretta thula*
White ibis	*Eudocimus albus*
Turkey vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Bald eagle	*Haliaeetus leucocephalus*
White-crowned pigeon	*Columba leucocephala*
Eastern screech-owl	*Otus asio*
Great egret	*Casmerodius albus*
Glossy ibis	*Plegadis falcinellus*
Wood stork	*Mycteria americana*
Little blue heron	*Egretta caerulea*
Tricolored heron	*Egretta tricolor*
Roseate spoonbill	*Ajaja ajaja*
Cattle egret	*Bubulcus ibis*
Reptiles	
Green anole	*Anolis carolinensis*
Brown anole	*Anolis sagrei*
Southeastern five-lined skink	*Eumeces inexpectatus*
Ground skink	*Scincella lateralis*
Eastern garter snake	*Thamnophis sirtalis*
Peninsula ribbon snake	*Thamnophis sauritus*
Eastern mud snake	*Farancia abacura*
Corn snake	*Elaphe guttata*
Florida cottonmouth	*Aghistrodon piscivorus*
Dusky pigmy rattlesnake	*Sistrurus miliarius*
Eastern diamondback	*Crotalus adamanteus*
Amphibians	
Florida cricket frog	*Acris gryllus*
Green treefrog	*Hyla cinerea*
Squirrel treefrog	*Hyla squirella*
Little grass frog	*Pseudacris ocularis*
Eastern narrow-mouth toad	*Gastrophyne carolinesis*
Southern leopard frog	*Rana utricularia*

Source: http://www.nps.gov/ever/eco/lists.htm and Snow 2002

Impacts of Alternative A: No Action / Continue Current Management

The no action alternative would result in the continued use of Eco Pond by wildlife. Many species, especially birds, are drawn to this freshwater pond for forage, and inter- and intra-specific interaction opportunities. The no action alternative would result in the continuation of these opportunities for wildlife and would, therefore, have a long-term, minor, beneficial effect.

The continued use of Eco Pond would also have the potential to expose wildlife to parasitic nematodes (worms) associated with the wastewater effluent. Macroparasites (such as the nematode) frequently weaken their hosts to near death, reducing their competitive ability and increasing their vulnerability to predation (Hudson *et al.* 1995). Nematodes have not been found in Eco Pond. Additionally, the behavior described has yet to be observed, and there is no evidence to suggest that it will. However, the potential exists and would continue under the no action alternative because these nematodes are found in wastewater treatment wetlands. The potential exposure of wildlife to these parasites would continue to represent a long-term, adverse effect on wildlife of undetermined consequence.

Cumulative Effects. The park is planning to upgrade the drinking water system and realign the main Flamingo road. Construction associated with these projects would likely cause temporary disturbance to wildlife. In addition, routine activities within the developed area, such as traffic, camping, and maintenance, would not be changed by the no action alternative. This alternative would make no contribution to the short- and long-term adverse effects to wildlife that occur due to ongoing activities or planned projects within the park.

Conclusion. Long-term, minor, beneficial effects to wildlife related to the continued use of Eco Pond as a habitat and source of freshwater would result from the no action alternative. Long-term, adverse effects of undetermined consequence, due to the perpetuation of potential wildlife exposure to parasitic nematodes would also continue.

Alternative A would not produce major adverse effects on wildlife or wildlife habitat whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's Master Plan or other NPS planning documents. Consequently, there would be no impairment of wildlife or wildlife habitat resources or values as a result of the implementation of Alternative A.

Impacts of Alternative B: The Preferred Alternative

In addition to those effects described under the no action alternative, the preferred alternative would result in disturbances associated with construction and installation of upgrading the wastewater treatment plant. Noise and the physical intrusion of machinery and personnel, though kept to a minimum, would adversely effect wildlife in the short-term (disturbances would last only as long as construction activities persisted). These effects would be due to wildlife retreating from or avoiding the area while construction would be taking place, and would be considered negligible, short-term, and adverse. Upon completion of the project, conditions would return to a pre-construction state.

Cumulative Effects. Other activities within the project area would occur coincident to the implementation of the preferred alternative. These activities would include, but not be limited to, the Flamingo Road realignment, traffic along the main park road, and the maintenance and operation of park concessions, facilities and utilities. These activities along with those associated with the preferred alternative would produce disturbances and consequent threats (some real but mostly perceived) to wildlife and their

habitats, and would result in negligible to minor, long-term, adverse effects.

Conclusion. In addition to the effects discussed under the no action alternative, the preferred alternative would result in negligible to minor, short-term, adverse effects to wildlife associated with the construction and installation of upgrading of the wastewater treatment plant. Wildlife would retreat from or avoid the project site during construction activities, but pre-existing conditions would return upon project completion.

Alternative B would not produce major adverse effects on wildlife or wildlife habitat whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's master plan or other NPS planning documents. Consequently, there would be no impairment of wildlife or wildlife habitat resources or values as a result of the implementation of Alternative B.

ENDANGERED, THREATENED, OR PROTECTED SPECIES AND CRITICAL HABITATS

Affected Environment

Everglades National Park provides habitat for a variety of federally listed endangered and threatened species. In the four south Florida units of the NPS – Big Cypress National Preserve, Everglades National Park, Biscayne National Park, and Dry Tortugas National Park – 14 endangered and 7 threatened wildlife species are found (NPS 1997). In addition, one federally listed threatened plant, Garber's spurge, is also found in Everglades National Park. Of the listed species, it is possible that the project area may be visited or utilized by 10 listed wildlife species (see Table 6).

The state of Florida has compiled the federal and state-listed species into a comprehensive listing. This information can be accessed at the Florida Fish and Wildlife Conservation Commission website at http://floridaconservation.org/pubs/endanger.html. Further information on all endangered species can be found at the U.S. Fish and Wildlife website at http://endangered.fws.gov/.

The Flamingo developed area contains infrastructure, park housing, and visitor facilities. This area is utilized by over 150,000 visitors and is home to park staff. Utilization of this area by endangered and threatened species is limited by the intensity of human activity and the nature of the site as a disturbed and developed area. Actions that would be performed under either alternative would be confined to previously disturbed areas.

The wastewater treatment plant lies within 500 feet of the brackish water Buttonwood Canal, and within 1500 feet of the artificial, freshwater environment at Eco Pond.

Stock Island tree snails are large buff-colored, conical snails, about two inches in length. The species is hermaphroditic and survives about six years. During the rainy season the snails are active, and enter a dormant stage during the dry months of December through May. Nests containing about 8 to 20 eggs are built in September and hatch in June. These snails graze on fungi and algae that grow on both smooth and rough-barked trees of hardwood hammocks. The historical range includes natural hammocks of Stock Island and Key West within the Florida Keys, but the species has recently been found only in one hammock on Stock Island (USFWS 1992).

The Stock Island tree snail has declined in population largely due to destruction of habitat. There is no direct competition with this species for food. Individuals are also lost to predation by cats and rodents. Recovery efforts have included collection of wild specimens for captive breeding. Additional sites in the Florida Keys are being investigated for reintroduction, and the Nature

Conservancy has been contracted to enhance the current stock (USFWS 1992).

Smalltooth sawfish (*Pristis pectinata*). The National Marine Fisheries Service proposed the smalltooth sawfish for federal listing on April 16, 2001. In the US, smalltooth sawfish are generally shallow water marine fish of inshore bars, mangrove edges, and seagrass beds. They are commonly found in shallow water throughout the northern Gulf of Mexico and also historically have been reported to migrate northward along the Atlantic seaboard. They subsist chiefly on whatever small schooling fish may be abundant locally, such as mullet and anchovies. They are generally two feet long at birth and may grow to a length of eighteen feet. Over the past century, the population of smalltooth sawfish has been reduced by fishing, habitat alteration, and habitat degradation. Currently smalltooth sawfish are primarily found in southern Florida and the Everglades and Florida Keys (National Marine Fisheries Service 2000). Within the Flamingo coastal area, they are occasionally caught and released by anglers.

TABLE 6: FEDERALLY LISTED ENDANGERED, THREATENED, AND CANDIDATE SPECIES WITH POTENTIAL TO OCCUR IN THE PROJECT AREA

Common Name	Scientific Name	Status
INVERTEBRATE		
Stock Island tree snail	*Orthalicus reses reses*	Threatened
FISHES		
Smalltooth sawfish	*Pristis pectinata*	Proposed
REPTILES		
American crocodile	*Crococylus acutus*	Endangered
Eastern indigo snake	*Drymarchon corias couperi*	Threatened
BIRDS		
Wood stork	*Mycteria americana*	Endangered
Cape Sable seaside sparrow	*Ammodramus maritime mirabilis*	Endangered
Everglades snail kite	*Rostrhamus sociabilis plumbeus*	Endangered
Bald eagle	*Haliaeetus leucocephalus*	Threatened
MAMMALS		
Mangrove fox squirrel	*Sciurus niger*	Candidate
Florida panther	*Felis concolor coryi*	Endangered
West Indian manatee	*Trichechus manatus*	Endangered

American crocodiles are the most widely distributed new world crocodile, ranging from southern Florida to northern South America. Their habitat consists of freshwater or brackish water coastal inlets, lagoons, and mangrove swamps. This species was listed as endangered in 1975, and has designated critical habitat within Everglades National Park. The American crocodile is a large species, with males reaching lengths of 15 to 18 feet (Ross, undated). American crocodiles feed at night, primarily eating fish and other aquatic species including turtles and crabs. They also take birds. The American crocodile is not considered especially aggressive or dangerous to humans (Britton 2002).

American crocodiles utilize holes or mounds for nesting and can use a variety of environments to construct their nests. The number of eggs in a nest ranges from 20 to

over 60. The total population of American crocodiles is not known. The Florida population is estimated to be 400 to 500 animals. American crocodiles have become endangered due largely to hunting and loss of habitat (destruction of coastal mangroves and beach development).

American crocodiles are found in the marine and brackish waterways adjacent to the Flamingo developed area. However, they are not found in the freshwater system at Eco Pond. Soil disturbance tends to attract American crocodiles seeking nesting sites. Any disturbance that would attract crocodiles to areas of high human use would require mitigation to prevent entrance and nesting (Everglades National Park, pers. comm., Snow 2002). American crocodiles nest during the dry season to avoid exposing eggs to the high water table associated with rainy weather (Britton 2002).

The **Eastern indigo snake** is a large, non-poisonous snake that may reach up to 8 feet in length. The eastern indigo snake gets its name from its shiny, blue-black color. Its diet consists mainly of other snakes, amphibians, small mammals, and occasionally birds and turtles. The species occurs throughout Florida and along the coastal plain of Georgia. Eastern indigo snakes prefer well-drained, sandy soils, and often use tortoise burrows for nesting. The range of these snakes varies by season and prey availability, and may cover from 12 to 266 acres (USFWS 1991).

The decline in Eastern indigo snake populations is attributed to loss of habitat to agriculture, and also to collecting for the pet trade. The docile nature of this animal has made it desirable as a pet (USFWS 1991). The species has also suffered from mortality during gassing of gopher tortoise burrows for rattlesnake collection. The species was listed in 1978, and has no designated critical habitat.

Little is known about the specific habits and niche of the Eastern indigo snake in Everglades National Park. The species is generally found in and near hardwood hammocks, and has shown no preference for disturbed sites. To avoid trapping these animals, it is best that pit excavation be avoided near hammocks, and that any open excavation be covered overnight (Everglades National Park, pers. comm., Snow 2002).

Wood storks are large, long-legged wading birds, standing about 50 inches tall, with a wingspan over 60 inches. They have white plumage and a short, black tail. Their bill is black, thick at the base, and curved. These birds eat small fish, and probe with their bills for their food in shallow water no more than about 10 inches deep. They feed in freshwater marshes, tidal creeks, and brackish wetlands, and nest primarily in cypress or mangrove swamps (USFWS 1996).

Wood storks use thermal drafts for soaring, and may travel 80 miles from nest to feeding areas. These birds are highly social and nest in large rookeries and feed in flocks. They are long-lived and first breed at four years old. The current world population is estimated at 11,000 birds. Their U.S. range consists of parts of Florida, Georgia, and South Carolina. In south Florida nesting occurs as early as October, with young leaving the nest in February or March. It is estimated that two fledglings will need almost 400 pounds of fish during this time. The decline in wood stork populations is attributed mostly to loss of habitat by destruction of wetlands and control of flows that created the Everglades (USFWS 1996).

Wood storks are known to forage in the vicinity of the project area, and are infrequently observed loafing (resting) in and around Eco Pond. A nesting colony has been established approximately 15 miles from Flamingo at Paurotis Pond. After several years without successful rearing of young, it appears that the Everglades colonies, including the population at Paurotis Pond, are producing offspring (Everglades National Park, pers. comm., Snow 2002).

Cape Sable seaside sparrows are small, olive-brown birds about 5 inches long. They are distributed over a large portion of south Florida, with the largest population in the Big Cypress National Preserve and near Taylor Slough. These birds were discovered in the early 1900s on Cape Sable in Monroe County and were placed on the endangered species list in 1967. Their designated critical habitat includes portions of Everglades National Park. Cape Sable seaside sparrows inhabit brushless, subtropical marshes that remain dry for most of the year. When seasonal floods inundate these areas, nesting behavior stops abruptly. Pairs generally nest 2 or 3 times each year (USFWS 1995).

Cape Sable seaside sparrows have declined primarily due to hydrologic and vegetation changes in their native range. The water control projects implemented throughout the Everglades, and intensive burning to promote agriculture, have disrupted their habitat. Periodic flooding is necessary to maintain subtropical prairie grasses, and they are susceptible to fire and hurricane. Hurricane Andrew in 1992 killed many individuals of this species (USFWS 1995).

Cape Sable seaside sparrows are known to nest and forage the shortgrass marsh habitat surrounding the Flamingo developed area (Everglades National Park, pers. comm., Snow 2002).

The **Everglades snail kite** is a medium-sized hawk that feeds almost exclusively on the *Pomacea* snail (apple snail), a large species occurring near the surface of Florida waters. The Everglades snail kite extracts the snail using its greatly curved beak. The Everglades snail kite inhabits open freshwater marshes, vegetated by sawgrass and spikerushes that support apple snails. The water level must be adequate to prevent drying out of the surface. This species was listed in 1967 and has designated critical habitat, including portions of Everglades National Park (USFWS 1991b).

The Everglades snail kite is threatened primarily from habitat destruction. Widespread drainage has lowered the water table, permitting drying. In addition, invasive plant species have grown in historically clear waters used by the kite for hunting by sight. These raptors are currently restricted to several locations in Florida. Recovery efforts include snail production management, protection of drought-related habitats, use of artificial nest structures, control of exotic vegetation, and limiting human disturbance. There is evidence that the population is responding, as counts have shown steady increases since the 1980s (USFWS 1991b).

The project area lies within the historical habitat of the Everglades snail kite. However, the species has not bred in this portion of the park for many years. There are no known nesting sites near Flamingo, although non-breeding kites are seen in the project area during winter foraging in suitable marshes such as Nine Mile Pond. Concentrations of these raptors occur further to the north, near Shark Valley and other northern portions of the park. In the event that the species would return to the area, the habitat and conditions would be appropriate for their use (Everglades National Park, pers. comm., Snow 2002).

The **bald eagle**, with its white head and tail and dark body, is one of the most recognizable American birds. These large predators may reach 14 pounds, with a wingspan of 8 feet. Bald eagles feed largely on fish and tend to be found near the seacoast, and along the banks of rivers and lakes. Their lifespan is over 30 years in the wild. They mate for life, returning to the same nest yearly, and laying two to three eggs. Bald eagles from northern parts of the range migrate south for the winter, gathering in roosting areas (National Wildlife Federation 2002).

The status of the bald eagle was changed from endangered to threatened in 1995. Recovering from the effects of DDT, ingestion of lead shot, and illegal hunting, the species has made a dramatic comeback (National Wildlife Federation 2002).

The Flamingo area includes a variety of habitats utilized by bald eagles, and the birds are frequently observed there. The nearest documented bald eagle nesting and overnight roosting sites are over 17 miles from Flamingo at Mahogany Hammock, though a morning roost has been reported about 1100 feet from Eco Pond. There is also an undocumented report of a nest at Snake Bight. Bald eagles also nest and forage in Florida Bay (Everglades National Park, pers. comm., Snow 2002).

The **mangrove fox squirrel** is a subspecies of the fox squirrel, found only in southwest Florida. Mangrove fox squirrels are 10 to 12 inches in body length, with tails 8 to 10 inches long. Most mangrove fox squirrels found in Florida are gray, black, and brown with white nose and ears. They may weigh up to two pounds. Their preferred habitat is mangrove stands, but they spend a great deal of time on the ground searching for nuts, buds, and seeds (Florida Fish & Wildlife Conservation Commission 2000).

Few details are known of the habits and specific preferences of this candidate species. Mangrove fox squirrels had not been seen in the Flamingo area for many years until recent occurrences of road fatalities. Three incidents of mortality along the road to Flamingo have now been documented. No observations or reports of the live individuals in the wild have been recorded (Everglades National Park, pers. comm., Snow 2002).

The **Florida panther** is a large, pale brown or buff cat with white underparts and tail tip. Mature males weight between 100 and 150 pounds and can reach seven feet from nose to tip of tail. Females are considerably smaller – from 50 to 100 pounds and up to six feet in length. Florida panthers subsist on a mammalian prey consisting of white-tailed deer, wild hogs, and in some areas raccoon. Home ranges cover from 20 to over 450 square miles. Only preliminary data is available on Florida panther reproduction. Litter sizes range from one to four kittens, with a breeding cycle of two years (USFWS 1993a).

In general, Florida panthers prefer large remote tracts with adequate prey, cover, and little disturbance. Habitat use is highly diverse and varies from upland hardwood hammocks, pinelands, and palm forests to wetland habitats of swamp and cypress. Cover is important, especially during hunting and denning. The Florida panther historic range extended from eastern Texas through the southeastern states. But today it is unlikely that viable populations of the Florida panther presently occur outside Florida. The only known self-sustaining population occurs in south Florida, generally within the Big Cypress Swamp region. Currently, the wild population is estimated to be 30 to 50 adult animals (USFWS 1993a).

The recovery plan, prepared by the Florida Panther Recovery Team, seeks to achieve three viable, self-sustaining populations within the historic range of the Florida panther. This is to be accomplished through three principal sub-objectives: identify, protect, and enhance existing panthers and protect habitats; establish positive public opinion support for panther management; and reintroduce Florida panthers into suitable habitat.

Florida panthers are occasionally sighted in the Flamingo area. Their use of the area is not yet clear. There have been no reports of breeding pairs or denning activity in the area. They most likely pass through the area during hunting activities, and their presence would be considered transient (Everglades National Park, pers. comm., Snow 2002).

The **West Indian manatee**, a federally listed endangered species is a fully aquatic herbivorous mammal, a distinction shared only with other Sirenians. The manatee occupies a prominent position in the park's marine and estuarine systems as a prodigious grazer of submerged aquatic vegetation, spending about five hours a day feeding and in that time consuming about four to nine percent of its body weight (20-45 kg/day) (Bengston 1983). Submerged aquatic vegetation, such as

seagrasses, is a major component of the diet of manatees, and although manatees appear to tolerate marine and hypersaline conditions, they are most frequently found in fresh or brackish waters.

Therefore, the effect of changes in freshwater flow on salinity patterns, submerged vegetation, and the overall quality of the foraging habitat in Florida Bay and elsewhere in the park are, along with water temperature, important influences on the distribution and abundance of manatees in the area. Movements and aggregations of manatees can be correlated to some degree with the distribution of seagrasses and vascular freshwater aquatic vegetation (Hartman 1974). Manatees may or may not need freshwater to survive, but they frequently are reported drinking freshwater from natural sources as well as hoses, sewage outfalls, and culverts in marine and estuarine areas. Little is known about the ability of manatees to osmoregulate and maintain water balance. Recent data suggest that manatees may require regular access to fresh, or perhaps brackish, water to meet water balance needs (Worthy 1998). Access to freshwater is probably more important to manatees than currently understood (Lefebvre, pers. comm. to Skip Snow 1998).

Increases in salinity are generally considered to result in less favorable conditions for manatees, although manatees move freely through a wide range of salinities. Adult manatees are seen on both sides of the Buttonwood Canal plug, year round, but most frequently on the Whitewater Bay side in winter months and on the Florida Bay side in spring and summer. As many as 10 to 15 manatees have been seen on the Whitewater Bay side at any one time. Cows with dependent calves are occasionally seen on the Whitewater Bay side. If water quality conditions are altered (e.g., increasing salinity), there is the possibility that manatees may choose to avoid the area. The probability of this response is difficult to predict, as there are most likely other physical and environmental variables at play.

State-listed Species

The state of Florida lists a variety of plant and animal species as endangered, threatened, species of special concern, or commercially exploited. The Florida Fish and Wildlife Conservation Commission (FWC) list includes 117 animals; the Florida Department of Agriculture has identified 413 plant species for listing; and the federal listing for the state includes 54 plants and 104 animal species. Of the state-listed species, nine animal species occur within the project area (Table 7).

The project area is inhabited by the **osprey** (*Pandion haliaetus*), a Florida state species of concern. This large, long-winged raptor is brown above and white below with a white head and a dark eye stripe. The wing has a distinctive bend at the "wrist" and from a distance can resemble a gull. This species ranges from Alaska eastward to Newfoundland and south to Arizona and Florida. They winter along the Gulf Coast and in California. They inhabit lakes, rivers, and seacoasts. They fish by hovering over the water; when they sight prey they dive talons first into the water. The nest is a mass of sticks and debris placed in trees, on telephone poles, on rocks, or on the ground. Most broods include two to four chicks. Due to the use of pesticides, osprey populations declined dramatically in the 1950s and 1960s, but since then the species has recovered significantly.

Three to four osprey nests have been identified near the new potable water treatment plant, within the Flamingo developed area. During well drilling for the new (future) water treatment plant, operations were temporarily suspended to assure that noise from the drilling did not interfere with nesting activities.

TABLE 7: STATE-LISTED ANIMAL SPECIES THAT OCCUR IN THE PROJECT AREA

COMMON NAME	SCIENTIFIC NAME	STATE OF FLORIDA STATUS
Osprey	*Pandion haliaetus*	Species of special concern
White-crowned pigeon	*Columba leucophala*	Threatened
Brown pelican	*Pelecanus occidentalis*	Species of special concern
Roseate spoonbill	*Platalea ajaja*	Species of special concern
Tricolored heron	*Egretta tricolor*	Species of special concern
Snowy egret	*Egretta thula*	Species of special concern
Little blue heron	*Egretta caerula*	Species of special concern
White ibis	*Eudocimus albus*	Species of special concern
Reddish egret	*Egretta rufescens*	Species of special concern

Source: Florida Fish and Wildlife Conservation Commission 2002

The **White-crowned pigeon** (*Columba leucocephala*) is a state-listed threatened species. In south Florida, including the greater Flamingo area, it is common in summer and uncommon in winter. The birds feed in hardwoods, such as fig, pigeon plum, poisonwood, and other fruit-bearing trees. Birds nesting on small keys in Florida Bay fly to the mainland (e.g., Flamingo area) or upper Keys (e.g., Key Largo) daily to feed. White-crowned pigeons have also been observed at Eco Pond. They are permanent residents in Florida, but their population numbers are highly seasonal. White-crowned pigeons begin returning to Florida in large numbers in April and the numbers increase until early June. Populations remain high through the summer with the seasonal peak occurring in September when many juvenile birds are flying. Most white-crowned pigeons leave Florida between mid-September and mid-October. Most white-crowned pigeons from Florida Bay and the upper Keys fly to the Bahamas. More than half of the Florida population nests in Florida Bay, in Everglades National Park. Nesting on mainland Florida is rare. Nesting requires mangrove covered islands that are free of raccoons and human disturbance.

White-crowned pigeons require an abundant supply of fruit. The plants that produce this fruit are found in a number of habitats on the southern tip of the peninsula and in tropical hardwood forests on the Florida Keys. Fruiting hardwoods in the vicinity of the project area provide potential feeding habitat for white-crowned pigeons. These areas are found on natural high ground hardwood hammocks and artificial high ground such as road shoulders, berms, and fill areas. Alternatives that disturb or remove fruit-bearing hardwoods the least are most favorable to white-crowned pigeons. Work conducted in the winter dry season months would be least disturbing to white-crowned pigeons.

Brown pelican *(Pelecanus occidentalis)*. The brown pelican is a large, brown water bird, with a white head and neck. Young brown pelicans have a gray head and neck and white underbelly. This species can reach up to 8 pounds and have a wingspan of over 7 feet. Brown pelicans nest in colonies on coastal islands. Nests are generally built in mangrove trees, but ground nests are also used. Nest types vary from practically nothing to well-built structures of sticks, reeds, palmetto leaves, and grass. The eastern subspecies nests in early spring or summer. Normal clutch size

for the brown pelican is three eggs. All courtship behavior is confined to the nest site. Males carry nesting material to females, which build the nests. Both share in incubation and rearing duties. Brown pelicans are long-lived; one brown pelican captured in Edgewater, Florida in November 1964, was found to have been banded in September 1933, over 31 years previously (Nesbitt 1996). Brown pelicans are commonly observed at the Flamingo Marina. They are often observed feeding offshore and day roosting in the coastal mangroves.

Roseate spoonbill *(Platalea ajaja).* Roseate spoonbills are found in the coastal marshes, mudflats, and mangrove keys from Florida to coastal Texas. These large wading birds stand almost 3 feet tall and have a wingspan in excess of 4 feet. "Roseate" refers to the brilliant pink color of the adult bird, with a bright red drip on the shoulders. The head and neck are white, with an orange tail and ruby red eyes. The bill is broad with a spatulate tip. This species is often found in small groups, often with other wading birds. To feed, roseate spoonbills immerse their bill tips in water and swing their heads from side to side. Their diet consists of small fishes, crustaceans, mollusks, slugs and aquatic insects. Roseate spoonbills often nest in rookeries with herons, ibis, and other wading birds. They construct their nests of sticks, in trees or bushes, 5 to 15 feet off the ground. Clutch size is generally 2 to 3 eggs that hatch in approximately 40 days. Young are white and acquire the pink color as they reach maturity in three years (Bjork and Powell 1996). Early in the 20th century, this species was depleted by the feather trade. Since protective laws have been enacted in Florida, their numbers have risen.

Roseate spoonbills are commonly observed flying over the Flamingo developed area and roosting at Eco Pond. They are occasionally seen feeding on flats near the Flamingo Visitor Center and within Eco Pond. They nest on islands in Florida Bay.

Tricolored heron *(Egretta tricolor).* Also called the Louisiana heron, this wading bird reaches 30 inches in height, and weighs up to one pound. Its slate-gray plumage is complemented by a white belly and a white chin stripe. During most of the year, the bill is yellow with a black tip and legs are yellow. During mating season the bill turns bright blue and the legs are bright pink. The tricolored heron is found from Massachusetts to the Gulf Coast. Its diet consists primarily of fish, but may include small reptiles, amphibians, insects, and crustaceans. This species usually breeds in brackish and saltwater coastal areas, in mixed colonies with other herons. Nests are close to the ground, with a clutch size of 3 to 4 eggs. The maximum recorded age of a tricolored heron recorded in nature is 17 years (Ogden 1996).

Tricolored herons are extremely common throughout most of Flamingo, including Eco Pond, the shoreline areas, and most places with standing water. These birds are observed feeding, but not nesting, in the Flamingo area. They appear to use Flamingo only during daylight hours.

Snowy egret *(Egretta thula).* The snowy egret is a small white heron, about 2 feet tall, with a 3 foot wingspan, and weighing just under 1 pound. This species is distinguished by a black bill and legs, with yellow feet. Both male and female have the same coloring. Snowy egrets breed in shared colonies in salt marshes, ponds and shallow bays. A clutch generally has 3 or 4 pale green eggs. Prey includes aquatic organisms and insects, such as shrimp, fish, frogs, and insects. They forage by walking slowly or standing motionless and striking at the prey. The species was reduced from common to rare by 20th century plume-hunting. Their numbers have rebounded with peak population reached in the 1950s (Ogden 1996a).

Snowy egrets are extremely common throughout most of Flamingo, including Eco Pond, the shoreline areas, and most places with standing water. These birds are observed feeding, but not nesting, in the Flamingo area. They appear to use Flamingo only during daylight hours.

Little blue heron *(Egretta caerula*). The little blue heron is a wading bird found along the Atlantic coast from Massachusetts to Florida, and is most abundant along the Gulf of Mexico. This species ranges up to 30 inches in height. It can have a wingspread of 3-feet. Adults have a purple head and neck, with the body slate-gray. The long neck is held in an "S" curve at rest and in flight. Young are all white, with a blue bill and green legs. Little blue herons feed during the day on fish, reptiles, crustaceans, and insects. The long bill is used to jab and eat the prey, with a success rate of about 60 percent. They lay 3 to 5 eggs, and both sexes tend the nest and feed the young. Young birds leave the nest within 50 days (Rodgers 1996).

Little blue herons are commonly seen in the Flamingo area, especially at Eco Pond and in the shoreline areas. They use the Flamingo area for feeding and day roosting only.

White ibis *(Eudocimus albus).* The white ibis is a medium-sized wading bird. Its feathers are entirely white, except for its dark wing tips. The face of the ibis is bare and pink, blending into a long, curved bill. It has long pink legs and webbed toes. Barriers, marshes, coastal islands and inland lakes are the preferred habitat and nesting sites. White ibis probe for aquatic crustaceans and insects using the curved bill. Pair formation depends on environmental conditions such as rain and food availability and does not occur at the same time each year. White ibis are highly sociable, nesting, feeding, roosting, and flying in flocks. Colonies begin as males gather to form a sort of bachelor party. The females then come and build nests of woody plants nearby. Two to three eggs are laid. Both sexes incubate and tend the young. After about 40 to 50 days of parental care they leave the nest. They do not leave the colony until they are nearly two years old (Frederick 1996).

White ibis are found throughout the Flamingo area, including the mowed lawns. They use the area, including Eco Pond, extensively for feeding and roosting. They have not been observed nesting within the Flamingo area. Large numbers are frequently seen at Eco Pond at sundown.

Reddish egret *(Egretta rufescens).* The reddish egret is an uncommon bird which breeds in scattered areas along the Gulf of Mexico, the Caribbean and west Mexico. Reddish egrets stand about 30 inches tall and have a wingspan of 4-feet. The head and neck are chestnut, and head plumes may give a golden-maned appearance. The reddish egret nests exclusively on coastal islands, usually building the nest of sticks, 10 to 20 twenty feet above the ground in bushes or trees. The average clutch size is 3 to 4, with incubation and care duties shared. In the early 1900s, most populations of reddish egrets were exterminated by plume hunters. Protection from plume hunters has helped reestablish and stabilize populations, but development pressure, and coastal dredging and filling are still a threat to their survival (Paul 1996).

Within the Flamingo area, reddish egrets have been observed feeding in the shallow coastal areas such as Snake Bight. They are rarely observed at Eco Pond.

State-listed Plants

Several state-listed plant species may occur in the project area, but specific information on these species or the likelihood of their occurrence is not available at this time. Prior to the implementation of the preferred alternative, a survey of the site would be conducted by a qualified, professional botanist (Everglades National Park, pers. comm., Armentano 2002). The plants contained on the state of Florida list with potential to occur in the project are presented below in Table 8.

TABLE 8: A PARTIAL LIST OF STATE-LISTED PLANT SPECIES WITH POSSIBILITY TO OCCUR IN THE PROJECT AREA

COMMON NAME	SCIENTIFIC NAME	STATE OF FLORIDA STATUS
Gray nicker	*Caesalpinia bonduc*	Endangered
Wild cinnamon	*Canella winterana*	Endangered
West Indian cocks comb	*Celosia nitida*	Endangered
Cowhorn orchid	*Cyrtopodium punctatum*	Endangered
Guiana plum	*Drypetes lateriflora*	Threatened
Dollar orchid	*Encyclia boothiana*	Endangered
Shell orchid	*E. cochleata*	Endangered
Blacktorch	*Erithalis fruticosa*	Threatened
Wild cotton	*Gossypium hirsutum*	Endangered
Manchineel	*Hippomane mancinella*	Endangered
Joewood	*Jacquinia keyensis*	Threatened
Florida mayten	*Maytenus phyllanthoides*	Threatened
Mule ear oncidium or Cape Sable dancing lady orchid	*Oncidiuim undulatum*	Endangered
Swampbush	*Pavonia paludicola*	Endangered
West Indian mahogany	*Swietenia mahagoni*	Threatened
Common wild pine	*Tillandsia fasciculata var. densispica*	Endangered
Giant wild pine, giant air plant	*T. utriculata*	Endangered
Inflated wild pine	*T. balbisiana*	Threatened
Worm-vine orchid	*Vanilla barbellata*	Endangered

Source: Everglades National Park, pers. comm. Armentano 2002

Impact Determinations to Federally Listed Threatened and Endangered Species

NPS scientific staff have made preliminary determinations as to what effect, if any, each of these alternatives would have on federally listed species. The National Park Service is in the process of informally consulting with the U.S. Fish and Wildlife Service, as detailed in Section 7 of the Endangered Species Act, to seek concurrence with the impact determinations.

Impacts of Alternative A: No Action / Continue Current Management

Stock Island tree snail. This species is unlikely to occur in the Flamingo area. If the species were found in the area, it would inhabit hardwood hammocks, which would not be affected by the no action alternative. There would be no effect to the Stock Island tree snail under the no action alternative.

Smalltooth sawfish. According to Jaffe *et al.* (2001), Eco Pond is not a significant contributor of total phosphorus to Florida Bay. This alternative is not expected to impact the marine environment. Therefore, this alternative is expected to have no effect on smalltooth sawfish.

American crocodile. Continued use of the current wastewater system would require periodic scheduled maintenance, as well as occasional emergency repairs, along the collection system and force main. During repairs, small-scale excavation would occur to provide access to the leaking section of the pipe. If such repairs occurred during nesting season, crocodiles could be drawn to the site. In the case of emergency repair, mitigation by timing of surface disturbance could not be accomplished. Mitigation to restrict crocodile access to any disturbance, such as fencing, would be implemented. There would be no long-term affects associated with this alternative. This may affect, but is not likely to adversely affect, the American crocodile.

Eastern indigo snake. Under the no action alternative, maintenance and repair would be necessary within the sewage collection network and along the force main. Small-scale excavation would be required, and open pits would be present for the time necessary to make repairs. Overnight covers would be placed over any open pits, but there is the possibility that individual indigo snakes could become trapped. It is unlikely that fatality would result from temporary trapping, but these individuals would be affected. This may affect, but is not likely to adversely affect, the Eastern indigo snake.

Wood stork. The foraging and loafing activities that occur within the project area would not be affected under the no action alternative. There would be no change in the aquatic life available as a food source. Because of the distance to the nesting colony, actions taken within Flamingo to maintain and repair the existing wastewater treatment system would not affect activities at the colony. Implementation of the no action alternative would have no effect on the wood stork.

Cape Sable seaside sparrow. These birds are known to nest in the shortgrass habitat surrounding the Flamingo developed area. The birds have adapted to levels of human activity occurring from visitation and park operations. Under current management, cattail control using Rodeo® (once a year) would continue, as would occasional repairs to the collection system and force main. The presence of equipment may cause sparrows to avoid the immediate area or reduce time spent in areas adjacent to management activities for the short-term duration of the action. This may affect, but is not likely to adversely affect, the Cape Sable seaside sparrow.

Everglades snail kite. Although some non-breeding kites forage in the winter in Nine Mile Pond, snail kites are otherwise rarely present in the project area. Breeding of snail kites in the project area has not been documented. Any actions in the Flamingo area

would have no effect on the Everglades snail kite.

Bald eagle. The bald eagle overnight roost sites and nest sites are approximately 17 miles north of the existing Flamingo developed area at Mahogany Hammock. No impacts to overnight roost sites or nest sites are anticipated. There is a morning roost site occasionally used by bald eagles about 1100 feet from Eco Pond. Actions taken for cattail control, any construction activity that might be needed to repair or replace collection lines, or to fix lateral leakage (if found) at Eco Pond, might cause any bald eagle present at the morning roost site to react by avoiding the area during construction. Upon completion of the project, conditions would return to a pre-construction state. Therefore, implementation of the no action alternative may affect, but is not likely to adversely affect on bald eagles.

Mangrove fox squirrel. Because the activities of the mangrove fox squirrel in the project area are largely unknown, it is not possible to determine a no-effect outcome for any management activities. However, because current management does not include disturbance in mangroves or hammocks likely to support the squirrel, it is unlikely that they would be affected. This may affect, but is not likely to adversely affect, the mangrove fox squirrel.

Florida panther. Panther use of the project area is largely transient, most likely during hunting. Under the no action alternative, routine maintenance and repairs of the exiting wastewater system would be unlikely to affect any individuals of this species. In the event that an individual animal encountered maintenance and repair activities, they would likely avoid the immediate area. Continuing current management may affect, but are not likely to adversely affect, the Florida panther.

West Indian manatee. This open-water, free-ranging species requires water of adequate depth for full submersion and access to a variety of habitat types including fresh and marine waters. Manatees are not found in Eco Pond. Because of the distance to open freshwater and Florida Bay, it is unlikely that the continued presence of Eco Pond would affect the habitat of this species. Therefore, the no action alternative would have no effect on this species.

State-listed Species

Osprey. The no action alternative is not expected to impact the roosting habitat for this species. Because ospreys forage in Florida Bay on fish, any disturbance associated with maintaining the existing wastewater collection and treatment system would not affect foraging. The no action alternative would have no effect on ospreys.

White-crowned pigeon. The no action alternative is not expected to impact hardwood hammock vegetation, which provides roosting and foraging habitat for the pigeon. Therefore, the no action alternative is expected to have no effect on white-crowned pigeons.

Brown pelican. According to Jaffe *et al.* (2001), Eco Pond is not a significant contributor of total phosphorus to Florida Bay. The no action alternative is not expected to impact the marine environment. Therefore, this alternative would have no effect on brown pelicans.

Roseate spoonbill. The no action alternative is not expected to impact the roosting habitat for this species. This alternative is not expected to affect the availability of forage fish in Eco Pond with respect to water depth or fish abundance. Roseate spoonbill nestlings in Florida Bay were infrequently found infected with *Eustrongylides*, a parasitic nematode (Spalding *et al.* 1993). Research suggests that high nutrient levels and warm water (20-30ºC) provide optimal conditions for a high density of *Eustrongylides* (Friend and Franson 1999). Nematode researchers consider the use of wetland areas for the treatment of nutrient polluted waters as a potential threat to local wading bird populations (Spalding *et al.* 1993). Therefore, the continued use of Eco Pond as a percolation pond (receiving effluent

from the WWTP) would provide a potential parasite infection source for this species. This alternative may affect, but is not likely to adversely affect local populations of roseate spoonbills.

Tricolored heron. The no action alternative is not expected to affect the availability of forage fish in Eco Pond with respect to water depth or fish abundance. Tricolored heron nestlings and adults in central and south Florida were frequently found infected with *Eustrongylides*, a parasitic nematode (Spalding *et al.* 1993). Research suggests that high nutrient levels and warm water (20-30ºC) provide optimal conditions for a high density of *Eustrongylides* (Friend and Franson 1999). Nematode researchers consider the use of wetland areas for the treatment of nutrient polluted waters as a potential threat to local wading bird populations (Spalding *et al.* 1993). Therefore, the continued use of Eco Pond as a percolation pond (receiving effluent from the WWTP) would provide a potential parasite infection source for this species. This alternative may affect, but is not likely to adversely affect local populations of tricolored herons.

Snowy egret. The no action alternative is not expected to affect the availability of forage fish in Eco Pond with respect to water depth or fish abundance. Snowy egret nestlings in central and south Florida were frequently found infected with *Eustrongylides*, a parasitic nematode (Spalding *et al.* 1993). Research suggests that high nutrient levels and warm water (20-30ºC) provide optimal conditions for a high density of *Eustrongylides* (Friend and Franson 1999). Nematode researchers consider the use of wetland areas for the treatment of nutrient polluted waters as a potential threat to local wading bird populations (Spalding *et al.* 1993). Therefore, the continued use of Eco Pond as a percolation pond (receiving effluent from the WWTP) would provide a potential parasite infection source for this species. This alternative may affect, but is not likely to adversely affect local populations of snowy egrets.

Little blue heron. The no action alternative is not expected to impact the roosting habitat for this species. This alternative is not expected to affect the availability of forage fish in Eco Pond with respect to water depth or fish abundance. Research suggests that high nutrient levels and warm water (20-30ºC) provide optimal conditions for a high density of *Eustrongylides* (Friend and Franson 1999). Nematode researchers consider the use of wetland areas for the treatment of nutrient polluted waters as a potential threat to local wading bird populations (Spalding *et al.* 1993). Little blue heron nestlings and adults in central and south Florida were frequently found infected with *Eustrongylides*, a parasitic nematode (Spalding *et al.* 1993). Therefore, the continued use of Eco Pond as a percolation pond (receiving effluent from the WWTP) would provide a potential parasite infection source for this species. This alternative may affect, but is not likely to adversely affect local populations of little blue herons.

White ibis. The no action alternative is not expected to impact the roosting habitat for this species. This alternative is not expected to affect the availability of forage fish in Eco Pond with respect to water depth or fish abundance. White ibis nestlings in central and south Florida were infrequently found infected with *Eustrongylides*, a parasitic nematode (Spalding *et al.* 1993). Research suggests that high nutrient levels and warm water (20-30ºC) provide optimal conditions for a high density of *Eustrongylides* (Friend and Franson 1999). Nematode researchers consider the use of wetland areas for the treatment of nutrient polluted waters as a potential threat to local wading bird populations (Spalding *et al.* 1993). Therefore, the continued use of Eco Pond as a percolation pond (receiving effluent from the WWTP) would provide a potential parasite infection source for this species. This alternative may affect, but is not likely to adversely affect local populations of white ibis.

Reddish egret. According to Jaffe *et al.* (2001), Eco Pond is not a significant contributor of total phosphorus to Florida Bay.

The no action alternative is not expected to impact the marine environment. Given the reddish egret's primary use of the marine habitat rather than Eco Pond, this species is not expected to be impacted by the presence or absence of the parasitic nematode *Eustrongylides*. Therefore, this alternative would have no effect on reddish egrets.

State-listed Plants

It is not known if the state-listed plant species occur within the project area. To avoid any disturbance to these species, a plant survey performed by a qualified botanist would be required prior to any actions requiring new disturbance of any previously disturbed areas. If identified, these species would be avoided and protected according to Florida regulations and requirements.

Cumulative Effects. The decline in populations of south Florida wildlife that has resulted in the designation of endangered and threatened species is due largely to habitat destruction. Large-scale water control projects installed to promote agriculture and development have resulted in disruption of the hydrologic cycle and destruction of native vegetation across the region. Within Everglades National Park, wildlife find refuge from development pressures and protection from hunting. The efforts of the park to protect species provides a benefit for their populations.

The park is planning to implement other projects within the Flamingo developed area. These plans include, but are not limited to, the Flamingo road realignment and installation of a new water treatment system. Implementation of these plans would include disturbance associated with construction activities. Because these activities would be contained within the Flamingo developed area where threatened and endangered species pursue few activities, they would not be likely to produce significant effects on these species.

The limited and unscheduled amount of disturbance associated with management actions of the no action alternative would not likely contribute detectably to regional cumulative effects on south Florida's threatened and endangered species.

Conclusion. The effects to endangered and threatened species under the no action alternative range from "no effect" to "may affect, not likely to adversely affect." The disturbance that could occur during cattail control at Eco Pond and during repair and maintenance of the wastewater collection system and force main would be small-scale and of duration sufficient only to complete repairs.

Alternative A would not produce major adverse impacts on endangered, threatened, or protected species or critical habitats or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's Master Plan or other National Park Service planning documents. Consequently, there would be no impairment of endangered, threatened, or protected species or critical habitats as a result of the implementation of Alternative A.

Impacts of Alternative B: The Preferred Alternative

Stock Island tree snail. This species has not been reported in the Flamingo area. If the species were found in the area, it would inhabit hardwood hammocks, which would not be affected by the preferred alternative. There would be no effect to the Stock Island tree snail under this alternative.

Smalltooth sawfish. The preferred alternative is expected to reduce the amount of nutrients entering Eco Pond. According to Jaffe *et al.* (2001), Eco Pond is currently not a significant contributor of total phosphorus to Florida Bay. As with Alternative A, Alternative B is not expected to impact the marine environment. Therefore, this alternative is expected to have no effect on smalltooth sawfish.

American crocodile. Under the preferred alternative, a limited amount of excavation would occur to place the footings of the elevated building and to install pump stations below ground at the existing wastewater treatment plant site. In the Flamingo developed area, it may be necessary to repair or replace portions of the collection system and force main. This would also require small areas of excavation and disturbance. To avoid attracting nesting crocodiles, excavation would not be performed during crocodile nesting season. Upgrading the wastewater treatment system may affect, but would not likely adversely affect, the American crocodile.

Eastern indigo snake. During installation of the upgraded wastewater system components, small areas of surface disturbance would be present for the time necessary to complete system installation and repair collection lines. These actions would take place in the developed area of Flamingo, not in or near the preferred habitat of the Eastern indigo snake. Actions undertaken to install the upgraded wastewater system at Flamingo may affect, but are not likely to adversely affect, the Eastern indigo snake.

Wood stork. The preferred alternative would not interfere with foraging and loafing activities that occur within the project area. There would be no change in the aquatic life available as a food source. Because of the distance to the nesting colony, actions taken within Flamingo to install the upgraded wastewater treatment system and repair the collection system would have no effect on the wood stork.

Cape Sable seaside sparrow. These birds are known to nest in the shortgrass habitat surrounding the Flamingo developed area. The birds have adapted to levels of human activity occurring from visitation and park operations. Under the preferred alternative, cattail control using Rodeo® would continue at Eco Pond on an annual basis. Installation of the upgraded wastewater treatment system would occur at the existing plant site. The presence of equipment may cause sparrows to avoid the immediate area or reduce time spent in areas adjacent to construction for the short-term duration of the action. This may affect, but is not likely to adversely affect, the Cape Sable seaside sparrow.

Everglades snail kite. Breeding kites have not been observed in the southern marshes of the park, including the greater Flamingo area, for many years. The snail kite now breeds in the northern part of the park and the Water Conservation Areas to the north of Tamiami Trail (U.S. Highway 41). Non-breeding kites, however, are seen in the project area in winter foraging in suitable marshes. Suitable habitat for the kite is still present near the project area, and no actions undertaken to implement the preferred alternative would diminish this. There would be no effect on the snail kite under implementation of the preferred alternative.

Bald eagle. The bald eagle overnight roost sites and nest sites are approximately 17 miles north of the existing Flamingo developed area at Mahogany Hammock. No impacts to overnight roost sites or nest sites are anticipated. There is a morning roost site occasionally used by bald eagles about 1,100 feet from Eco Pond. Actions taken for cattail control, any construction activity that might be needed to repair or replace collection lines, or to fix lateral leakage (if found) at Eco Pond, might cause any bald eagle present at the morning roost site to react by avoiding the area during construction. Upon completion of the project, conditions would return to a pre-construction state. Therefore, implementation of the preferred alternative may affect, but is not likely to adversely affect bald eagles.

Mangrove fox squirrel. Actions undertaken to complete the upgrade of the wastewater system would not affect hardwood hammocks or mangroves. Because these are the preferred habitat for this species, it is unlikely that implementation of the preferred alternative would affect the mangrove fox squirrel. However, a no-effect determination cannot be made because little is known about their

specific activities in the Flamingo area. Implementation may affect, but is not likely to adversely affect, this species.

Florida panther. Construction activities associated with installation of the new wastewater system would occur within the Flamingo developed area. This disturbance would be temporary, and all disturbed areas would be reclaimed. Individual panthers that may pass through the area during construction activities would likely avoid the disturbance. Implementation of the preferred alternative may affect, but would not likely adversely affect, the Florida panther.

West Indian manatee. The reduced nutrient content of the infiltrating water from Eco Pond would be unlikely to affect the habitat of this open-water species. In addition, implementation activities would not occur in manatee habitat. Therefore, the preferred alternative would have no effect on the West Indian manatee.

State-listed Species

Osprey. The preferred alternative is not expected to impact the roosting habitat for this species. Because ospreys forage in Florida Bay on fish, any disturbance associated with construction and replacement of the wastewater collection and treatment system would not affect foraging. The preferred alternative is expected to have no effect on ospreys.

White-crowned pigeon. The preferred alternative is not expected to impact hardwood hammock vegetation, which provides roosting and foraging habitat for the pigeon. Therefore, the preferred alternative is expected to have no effect on white-crowned pigeons.

Brown pelican. The preferred alternative is expected to reduce the amount of nutrients entering Eco Pond. According to Jaffe *et al.* (2001), Eco Pond is currently not a significant contributor of total phosphorus to Florida Bay. As with Alternative A, Alternative B is not expected to impact the marine environment. Therefore, this alternative is expected to have no effect on brown pelicans.

Roseate spoonbill. The preferred alternative is not expected to impact the roosting habitat for this species. This alternative is not expected to affect the availability of forage fish in Eco Pond with respect to water depth or fish abundance. Spalding *et al.* (1993) suggested that higher nutrients lead to increases in nematode densities. Therefore, the preferred alternative, which would decrease the amount of nutrients sent to Eco Pond, may decrease nematode density (if present) at Eco Pond and therefore decrease the threat to local wading bird populations from this nematode. The preferred alternative may affect, but is not likely to adversely affect local populations of roseate spoonbills.

Tricolored heron. This alternative is not expected to affect the availability of forage fish in Eco Pond with respect to water depth or fish abundance. Spalding *et al.* (1993) suggested that higher nutrients lead to increases in nematode densities. Therefore, the preferred alternative, which would decrease the amount of nutrients sent to Eco Pond, may decrease nematode density (if present) at Eco Pond and therefore decrease the threat to local wading bird populations from this nematode. The preferred alternative may affect, but is not likely to adversely affect local populations of tricolored herons.

Snowy egret. This alternative is not expected to affect the availability of forage fish in Eco Pond with respect to water depth or fish abundance. Spalding *et al.* (1993) suggested that higher nutrients lead to increases in nematode densities. Therefore, the preferred alternative, which would decrease the amount of nutrients sent to Eco Pond, may decrease nematode density (if present) at Eco Pond and therefore decrease the threat to local wading bird populations from this nematode. The preferred alternative may affect, but is not likely to adversely affect local populations of snowy egrets.

Little blue heron. The preferred alternative is not expected to impact the roosting habitat for this species. This alternative is not expected to affect the availability of forage fish in Eco Pond with respect to water depth or fish abundance. Spalding *et al.* (1993) suggested that higher nutrients lead to increases in nematode densities. Therefore, the preferred alternative, which would decrease the amount of nutrients sent to Eco Pond, may decrease nematode density (if present) at Eco Pond and therefore decrease the threat to local wading bird populations from this nematode. The preferred alternative may affect, but is not likely to adversely affect local populations of little blue herons.

White ibis. The preferred alternative is not expected to impact the roosting habitat for this species. This alternative is not expected to affect the availability of forage fish in Eco Pond with respect to water depth or fish abundance. Spalding *et al.* (1993) suggested that higher nutrients lead to increases in nematode densities. Therefore, the preferred alternative, which would decrease the amount of nutrients sent to Eco Pond, may decrease nematode density (if present) at Eco Pond and therefore decrease the threat to local wading bird populations from this nematode. The preferred alternative may affect, but is not likely to adversely affect local populations of white ibis.

Reddish egret. The preferred alternative is expected to reduce the amount of nutrients entering Eco Pond. According to Jaffe *et al.* (2001), Eco Pond is currently not a significant contributor of total phosphorus to Florida Bay. As with Alternative A, Alternative B is not expected to impact the marine environment. Given the reddish egret's primary use of the marine habitat rather than Eco Pond, this species is not expected to be impacted by the presence or absence of the parasitic nematode *Eustrongylides*. Therefore, this alternative is expected to have no effect on reddish egrets.

State-listed Plants

The status of state listed plant species within the project area is not currently known. To avoid any disturbance to these species, a plant survey, performed by a qualified botanist, would be required prior to any actions necessitating disturbance. If identified, these species would be avoided and protected according to Florida regulations and requirements.

Cumulative Effects. South Florida's wildlife is threatened primarily from habitat destruction. Disruption of the hydrologic cycle and changes in vegetative communities are widespread in the region. Everglades National Park, in concert with other federal and state protected areas, provides protection for these species.

Other plans for activities in the Flamingo area include road realignment and installation of a new water treatment system. Because the construction associated with these projects would be confined to the previously disturbed and developed areas of Flamingo, threatened and endangered species would not be likely to experience significant effects as a result of these projects.

The limited disturbance necessary to complete the new wastewater treatment system, in concert with other planned management activities in Flamingo, would not be likely to make a detectable contribution to effects on endangered and threatened species in south Florida.

Conclusion. The effects to endangered, threatened, and protected species under the preferred alternative range from “no effect” to “may affect, not likely to adversely affect."

Additionally, there would be no adverse effects to the designated critical habitats of any of these species. Ongoing cattail management (spraying with herbicide once a year) at Eco Pond would remain unchanged and is not likely to affect any listed species. The limited amount of surface disturbance, and the fact that excavation is restricted to previously disturbed and developed areas, also reduces the potential for effects to threatened and endangered species.

Alternative B would not produce major adverse impacts on endangered, threatened, or protected species or critical habitats whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park’s Master Plan or other National Park Service planning documents. Consequently, there would be no impairment of endangered, threatened, or protected species or critical habitats as a result of the implementation of Alternative B.

AQUATIC LIFE

Affected Environment

The area of analysis for aquatic life consists of both freshwater and marine habitats and the populations and communities associated with them. Below are descriptions of both habitat types and their associated communities as they occur within the project area.

Freshwater

The lined sewage lagoon by the wastewater treatment plant is an artificial habitat and represents an “attractive nuisance” (potentially harmful since wildlife tend to be drawn to it). American alligators frequently dig under the surrounding fence and bask on the black lining. Wading and shore birds have also been observed within the fenced area of the lagoon.

Eco Pond is a constructed freshwater percolation pond. This pond is supplied by the effluent of the existing wastewater treatment plant and is the only source of freshwater for wildlife within the greater Flamingo area. The pond supports dense communities of fish as well as a variety of amphibian and reptile species. Some of the more common species observed in this region are listed in Table 9.

Marine

The brackish interface between fresh and salt water provides a rich environment, high in biodiversity. The region of potential impact within this marine/brackish environment is composed of saltwater marshes, Florida Bay and Buttonwood Canal. Over 100 species of fish and a variety of invertebrate species have been identified in Florida Bay. American crocodile and West Indian manatee, though rare, are occasionally found in the bay as well as the canal (these species are discussed in the “Endangered and Threatened Species” section of this document).

Marine species observed within the region are included in Table 10.

TABLE 9: FRESHWATER WILDLIFE WITHIN THE AREA OF ANALYSIS

Common Name	*Scientific Name*
Amphibians	
Everglades dwarf siren	*Psendobranchus striatus*
Peninsula newt	*Notophthalmus viridescens*
Reptiles	
Brown water snake	*Nerodia taxispilota*
Florida water snake	*Nerodia fasciata*
South Florida swamp snake	*Seminatrix pygaea*
American alligator	*Alligator mississippiensis*
Striped mud turtle	*Kinosternon baurii*
Diamondback terrapin	*Malaclemys terrapin*
Florida softshell turtle	*Apalone ferox*
Fish	
Largemouth bass	*Micropterus salmoides*
Bluegill	*Lepomis macrochirus*
Florida gar	*Lepisosteus platyrhincus*
Mosquitofish	*Gambusia holbrooki*

Source: http://www.nps.gov/ever/eco/lists.htm

TABLE 10: MARINE WILDLIFE WITHIN THE AREA OF ANALYSIS

Common Name	*Scientific Name*
Reptiles	
American crocodile	*Crocodylus acutus*
Mangrove salt marsh snake	*Nerodia clarkii*
Mammals	
West Indian manatee	*Trichechus manatus*
Fish	
Snook	*Centropomus undecimalis*
Red drum	*Sciaenops ocellatus*
Spotted seatrout	*Cynoscion nebulosus*
Gray snapper	*Lutjanus griseus*
Tarpon	*Megalops atlanticus*
Black drum	*Pogonias cromis*
Sheepshead	*Archosargus probatocephalus*
Spanish mackerel	*Scomberomorus commerson*
Lady fish	*Elops saurus*
Crevalle jack	*Caranx hippos*

Source: http://www.nps.gov/ever/eco/lists.htm

Impacts of Alternative A: No Action / Continue Current Management

Freshwater

The no action alternative would result in the perpetuation of wildlife using the lined sewage lagoon as an artificial habitat. American alligators and wading/shore birds would continue to enter into this attractive nuisance and would remain at risk of exposure to raw sewage during the infrequent use of the lagoon for emergency storage. This alternative maintains the potential for long-term, adverse effects ranging from negligible to minor (depending on length of exposure). Individuals may be injured, but the viability of the population and community would not be affected.

This alternative would also result in the continued use of Eco Pond as a habitat for aquatic life. Many fish, reptile and amphibian species live within the pond or use it for forage, and inter- and intra-specific interaction opportunities. The no action alternative would result in the continuation of these opportunities for aquatic life and would, therefore, have a long-term, minor, beneficial effect.

Marine

No changes in the water quality of Florida Bay or effects to marine species have been associated with current wastewater management at Flamingo. It is, therefore, unlikely that continued implementation of the no action alternative would result in effects to marine life in Florida Bay.

Cumulative Effects. The park is planning to upgrade the potable water system and realign the main Flamingo road. The new water system would discharge salty brine into nearby Buttonwood Canal, with anticipated negligible to minor, long-term adverse effects on marine species. Road construction would not be likely to affect aquatic species. Continuation of current management would contribute beneficially, at a minor level, to effects of other project by providing a freshwater habitat in this largely marine environment.

Conclusion. The no action alternative would result in the continuation of current conditions including use of the lined sewage lagoon as an artificial habitat. This creates the potential for contact with raw sewage, and is considered a negligible to minor, long-term, adverse effect. Eco pond would also continue to be utilized as an artificial habitat, but would benefit wildlife by providing forage and interaction opportunities. This would be a minor, long-term, beneficial effect.

Alternative A would not produce major adverse effects on aquatic life whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's Master Plan or other NPS planning documents. Consequently, there would be no impairment of aquatic life as a result of the implementation of Alternative A.

Impacts of Alternative B: The Preferred Alternative

Freshwater

Under this alternative, Eco Pond would continue to serve as a freshwater habitat, and emergency storage of raw wastewater would occur periodically in the lined lagoon. The improved quality of the treated effluent discharged to Eco Pond is not likely to directly affect wildlife. In addition, freshwater species would occasionally have the potential to be exposed to untreated wastewater in the lined lagoon. Because the habitat conditions remain largely unchanged, the preferred alternative would result in the same impacts and cumulative effects to freshwater life as the no action alternative.

Marine

No changes in the water quality of Florida Bay or effect to marine habitat would be anticipated to occur as a result of implementing Alternative B. Therefore, no effects on marine species would occur in association with this alternative.

Cumulative Effects. Park plans to upgrade the potable water system and realign the main Flamingo road would not be affected by this alternative. Eco Pond would benefit freshwater species, and there would be occasional potential for wildlife to be exposed to raw wastewater. The preferred alternative would contribute beneficially, at a minor level, to effects of other projects by continuing to provide freshwater habitat in this largely marine environment.

Conclusion. The presence of the artificial, freshwater habitat at Eco Pond contributes beneficially, at a minor level, to wildlife of the Flamingo area. This alternative would not change the anticipated adverse effects of the brine discharge associated with the new water treatment system,

Alternative B would not produce major adverse impacts on aquatic life whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other NPS planning documents. Consequently there would be no impairment of aquatic life as a result of the implementation of alternative B.

VEGETATION

Affected Environment

The majority of the area of analysis is highly disturbed and contains artificially maintained vegetation. Mowed lawn covers much of the proposed action site including the area surrounding the wastewater treatment plant, and throughout the campgrounds and concessioner's development (where the collection system runs).

The general region encompassing the developed area described above is coastal prairie interspersed with mangrove stands. The region supports thickets of Brazilian pepper (*Schinus terebinthifolius*) and lather leaf (*Colubrina asiatica*), both of which are exotic species, as well as a number of native vines, herbs, and small shrubs that occur along the edges and in the understory of these thickets.

Coastal Prairie
Located within the mangrove zone inland of Florida Bay and the Gulf of Mexico, coastal prairie is a habitat characterized by salt-tolerant herbaceous vegetation subject to salt-water inundation associated with strong tropical storms and saltwater intrusion in droughts. It is characterized by succulents and other low-growing plants that can withstand the harsh conditions. For more information about the vegetation and habitat, refer to Craighead (1971) and also the park's website at http://www.nps.gov/ever/eco/habitats.htm.

Mangroves
Mangrove forests are found in coastal areas subject to regular or sometimes only occasional tidal flushing, which produces elevated soil salinity. Each mangrove species has a different level of salt tolerance, which in part determines its location in tidal zones. Mangroves grow best where freshwater runoff contributes nutrients and helps maintain optimum salinity levels. Mangrove forests provide foraging and nesting sites for wading birds and nursery habitat for pink shrimp and numerous other fish. For more information about the vegetation and habitat, refer to Craighead (1971) and also the park's website at http://www.nps.gov/ever/eco/habitats.htm.

Impacts of Alternative A: No Action / Continue Current Management

Currently, untreated sewage from the concessioner's development and campground has the potential to leak out of aged collection

lines and into the surrounding groundwater. This causes a buildup of nutrients (mainly nitrogen and phosphorus), which might have the potential to stimulate plant growth. This, however, is largely offset by the prevalence of a lawn grass monoculture and absence of native plant communities throughout the majority of the project area.

Another source of elevated nutrients related to the wastewater treatment plant is the treated effluent from the plant itself. The plant does not currently meet effluent standards (on an average annual basis) for nitrates. Phosphorus discharge is currently unregulated. Present levels typically range from four to five parts per million (NPS discharge monitoring report to FDEP 2002c). This results in lush cattail growth around Eco Pond and nutrient loading within its sediments.

The no action alternative would allow for the continuation of current conditions including potential leakage of the collection system and failure to meet effluent discharge standards. Long-term, negligible, adverse effects to vegetation, such as elevated growth rates, brought about by these nutrient sources would also continue.

Another result of the no action alternative is the continued surface disturbances related to the repair and maintenance of the collection system piping. This piping is aged, and requires regular repair. Repairs require ground surface disturbances within the localized area and, in turn, tend to facilitate recolonization by exotic (non-native) plant species. This is considered to be a short- and long-term, negligible to minor, adverse effect to vegetation.

Cumulative Effects. Repair of the existing collection and treatment systems coupled with ongoing park activities, the proposed Flamingo water treatment upgrade and the proposed road realignment project would result in minimal disturbance to vegetation within the project area. These disturbances would include localized trampling and vegetation removal surrounding repair and installation sites. These disturbances would result in negligible to minor, short- and long-term, adverse, cumulative effects to vegetation.

Conclusion. Short- and long-term, adverse effects to vegetation resulting from the implementation of the no action alternative would range from negligible to minor, and would result from:

- the continued need for repairs to the collection system and effluent transmission piping, and
- continued nutrient loading from untreated sewage potentially leaking from the collection system lines and from treated wastewater effluent being released from Eco Pond.

Alternative A would not produce major adverse impacts on vegetation whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's Master Plan or other NPS planning documents. Consequently, there would be no impairment of vegetation as a result of the implementation of Alternative A.

Impacts of Alternative B: The Preferred Alternative

Under the preferred alternative the collection system would be repaired and replaced as needed. This would greatly reduce the potential amount of raw sewage and associated nutrients leaking out into the surrounding groundwater. Effluent nutrient levels entering Eco Pond would also be decreased significantly. These actions would reduce existing impacts to vegetation related to nutrient loading, and would represent a long-term, negligible, beneficial effect when compared to no action.

Conversely, negligible to minor, short-term, adverse effects to vegetation would result

from surface disturbances encountered when upgrading the wastewater treatment plant and when rehabilitating the collection system lines. As mentioned previously, these disturbances often facilitate recolonization by exotic (non-native) plant species, although the vast majority of the ground disturbances would be on previously disturbed fill colonized by lawn grasses.

Cumulative Effects. Other activities within the area of potential impact would occur coincident to the implementation of the preferred alternative. These activities would include, but not be limited to, the proposed road realignment. These activities along with those associated with the preferred alternative would produce disturbances (i.e., trampling of vegetation), and result in negligible to minor, long-term, adverse, cumulative effects to vegetation.

Conclusion. Short-term, adverse effects to vegetation resulting from the implementation of the preferred alternative would range from negligible to minor and would be the result of ground disturbances associated with upgrading the wastewater treatment plant and the rehabilitation of the collection system.

A long-term, negligible to minor, beneficial effect to vegetation would result from the cessation of untreated sewage leaking from the collection lines, and a decrease in effluent nutrient levels entering Eco Pond.

Alternative B would not produce major adverse effects on vegetation whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's Master Plan or other NPS planning documents. Consequently, there would be no impairment of vegetation as a result of the implementation of Alternative B.

CULTURAL RESOURCES

Affected Environment

Prehistoric Resources. Human occupation of southern Florida may date back as far as 4,000 years. The presence of black earth middens, shell mounds, evidence of transient camps, and features containing stone tools and implements indicate that humans have used this area for many centuries. Black earth middens are mounds of soil and shells that now support lush hammock growth. These formations are common across marshy south Florida. Artifacts found in these locations include ceramics, bone tools and ornaments, and food debris (shell and bone) that reflect the diet of these early inhabitants. Modern exploration and documentation of prehistoric resources indicate that the area was continuously occupied by humans during the Glades period, approximately A.D. 400 to 1400. In many instances, these archeological sites have been farmed, used as historic hunting camps, and been sites of artifact collection, looting and vandalism (NPS 2001b).

The Everglades were most likely the year-round home of early transient hunter-gatherer groups. These people relied on wild foods and shellfish for sustenance, and ranged across the area to find food sources. Little evidence of permanent settlements has been located.

Two prehistoric sites have been recorded near the Flamingo/Cape Sable area. The closest, the Bear Lake Mounds, are located approximately three miles north of the project area near the Homestead Canal. The second, the Coot Bay Middens, lie between Coot Bay and Mud Lake, approximately four miles to the northeast of Flamingo (Taylor1985).

Ethnographic Resources. When Europeans began arriving in south Florida around A.D. 1500, they found a thriving population of about 20,000 American Indians. There were five tribes, two of which – the Tequesta and Calusa – inhabited the area that is now Everglades National Park. When the English

gained control of Florida in 1793, only a few hundred members of these tribes remained. The Calusa continued to inhabit the western portions of south Florida until the end of the Seminole War in 1839. The last of the Calusa either united with the Seminole population or migrated to Cuba with the Spanish (Swanton 1979).

Two American Indian tribes presently reside in south Florida. The Seminole and Miccosukee are descendants of Creek Indians who immigrated to the area during the A.D. 1600s to 1800s. These groups resisted relocation to the reservations of Oklahoma and retreated into the far reaches of what is today Everglades National Park and Big Cypress National Preserve (NPS 2001b).

The Seminole Tribe incorporated in 1957, and the Miccosukee incorporated in 1962. Many members of the Seminole Tribe now occupy the Big Cypress Seminole Reservation. There are members of both groups that remain unaffiliated and politically independent. The Miccosukee Tribe of Indians of Florida have constructed and now operate a casino northeast of Everglades National Park.

Sheet water flows in south Florida are from the northeast to the southwest. Flamingo is located on the southern edge of mainland Florida, and is many miles downstream of Indian trust resources and Indian reservations. There are no Indian trust resources or reservations downstream of Flamingo.

Historic Resources. Between A.D. 1500 to 1750, Europeans arrived in the area. Early mariners recorded the locations of Cape Sable, located just west of Flamingo. Several attempts were made to settle the area in the 1800s, but environmental conditions and conflict with American Indians prevented the success of early white settlement (U.S. National Parks Net 2002).

The U.S. Government transferred much of the land in south Florida to state control in 1850. Over the next 50 years, non-Indian settlers arrived by boat to the area that is now the western portion of Everglades National Park. Settlement remained near the bay until construction of the Tamiami Trail in 1928 brought settlers inland (NPS 2001b).

Flamingo was established in 1898, when about 50 families gathered into a community and engaged in fishing, hunting, and farming. Residents hoped the railroad line to Key West would pass through their small town. When this did not happen, the community began its decline. In 1919 there were about half a dozen structures in Flamingo, including a school and three houses. In 1921 a road to the town of Homestead opened, but this did not foster economic growth (Paige 1986). Road access did not solve the problems of limited water supply and hordes of insects.

All of the early buildings constructed at Flamingo have been destroyed over the decades by hurricanes. The area was struck by storms in 1909, 1910, 1926, and again in 1935, with each storm delivering considerable damage. In 1960 Hurricane Donna destroyed those buildings at Flamingo that predated park designation (Paige 1986).

Approximately 20 miles east of Flamingo, is the proposed Ingraham Highway Historic District. In 1916 Royal Palm State Park was established; a road was barely completed from Homestead to the state park in time for the dedication. This highway, eventually named the Ingraham Highway, was the first to cross the Everglades. The roadway and three of its associated drainage canals are now proposed for nomination to the National Register of Historic Places (NPS 2000b). This location is now part of Everglades National Park. Only one historic structure remains at the site of the Royal Palm Lodge. It is a cement-walled storage area about the size of an outhouse, commonly referred to as the "deer feeding station." The structure is overgrown and completely out of sight from most visitors' view. Some local guides lead novelty tours back to the area during the winter months.

Cultural Landscape. No cultural landscape has been designated for Flamingo; thus there

is no cultural landscape report available for the project area. The modern Flamingo includes a marina, visitor center and museum, motel accommodations, and park housing. All structures were built since the park was established in 1947. The fill underlying the existing facilities was placed over several decades and varies in composition and depth. Most buildings are of concrete and cinder block, built for function and to withstand environmental conditions. However, the buildings, lawns, and palm trees, set against the backdrop of the lush and exotic Everglades environment, convey a special sense of place to the visitor.

Previous Investigations

Everglades National Park, including the Flamingo area, has been surveyed for archeological sites. Taylor (1985) lists two prehistoric middens several miles from the project area. This report also includes the finding of cultural material on two outlying Florida Bay keys.

Impacts of Alternative A: No Action / Continue Current Management

Any repair or maintenance activities associated with current management would occur in previously disturbed areas, most of which have been excavated and filled to accommodate construction of existing park facilities. Because there is no soil disturbance, excavation, or construction in previously undisturbed areas, continuation of existing conditions would not be likely to have any impact on prehistoric, historic, ethnographic, or cultural resources.

Cumulative Impacts. Because there is no disturbance in previously undisturbed areas associated with ongoing management, implementation of the no action alternative would not contribute either beneficially or adversely to cumulative impacts on cultural resources at Flamingo or in Everglades National Park. Effects to parkwide or regional resources caused by vandalism, theft, or looting would not be mitigated under this alternative.

Conclusion. There are no known historic resources in the project area. Because there is no new excavation, the opportunity to locate previously unknown historic resources is eliminated. There would be no impacts to cultural resources as a result of implementation of the no action alternative.

Alternative A would not produce major adverse impacts on cultural resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's Master Plan or other NPS planning documents. Consequently, there would be no impairment of cultural resources or values as a result of the implementation of Alternative A.

Impacts of Alternative B: The Preferred Alternative

Implementation of the preferred alternative would have no impact on known prehistoric or historic resources. Known sites in the area are outside the potential project area, and would not be affected.

There is also little potential for discovery of or damage to previously unknown historic resources. The area has largely been excavated and filled to allow for installation of infrastructure and development. The new generator/office building to house wastewater treatment components would be placed on existing fill, adjacent to the existing wastewater plant. If sections of the wastewater collection system are replaced, the existing trench line would be utilized, and no new excavation outside the immediate area would occur. However, should the collection lines be designed around the Flamingo road realignment project, then trenches would have to be dug in new areas. There is no expansion of the lined lagoon, percolation pond, or Eco Pond. No new disturbance would occur under

this alternative, unless the project is designed around the Flamingo road realignment, as described above.

Cumulative Impacts. Because there is no disturbance in previously undisturbed areas associated with the preferred alternative, this alternative would not contribute either beneficially or adversely to cumulative impacts on cultural resources. Park plans to realign the Flamingo roadway and install a new water treatment system would also occur on previously disturbed sites. The proposed road realignment would include degrading some of the existing roadways and removal of underground utilities. The combination of these park actions is unlikely to result in detectable effects on the historic resources of Everglades National Park.

Conclusion. Because all disturbance associated with the preferred alternative occurs on fill and in previously disturbed areas, it is unlikely that there would be detectable impacts on cultural resources as a result of implementation of this alternative.

Alternative B would not produce major adverse impacts on cultural resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's Master Plan or other NPS planning documents. Consequently, there would be no impairment of cultural resources or values as a result of the implementation of Alternative B.

SECTION 106 SUMMARY

A variety of researchers have visited the Flamingo/Cape Sable area to locate and document the historic resources of the area (Taylor 1985; Paige 1986; Tebeau 1968). Two prehistoric midden sites are located several miles north of the project area. These are the Bear Lake Mounds and Coot Bay Middens. These prehistoric sites were visited and documented as early as 1924. Excavation at the mounds has yielded potsherds, fiber sources, animal bones, and shell fragments. The locations of these sites were confirmed by the Southeast Archeological Center during February and March of 1984. Their visit revealed that vandalism had occurred in the form of excavation of several small pits (Taylor 1985).

Taylor also reported the occurrence of historic resources in the form of olive jar shards, pottery, and copper on Curry Key and Bradley Key, in Florida Bay. These were most likely left by early Spanish explorers. These sites are outside the area of potential impact. The Keys were visited by representatives from the Southeast Archeological Center in March of 1984. No additional artifacts were seen and no *in situ* deposits were observed (Taylor 1985).

No traditional cultural properties have been identified within the project area. Consultation with tribes and with the Florida State Historic Preservation Office (SHPO) has been initiated (see correspondence in Appendix B). A copy of this environmental assessment will be forwarded to tribes and the SHPO for review and comment.

This environmental assessment provides detailed descriptions of two alternatives (including a no action alternative), analyzes the potential impacts associated with possible implementation of each alternative, and describes the rationale for choosing the preferred alternative. Also contained in the environmental assessment are mitigation measures that would help avoid adverse impacts on cultural resources (see Table 2).

The area of the proposed new Flamingo wastewater treatment plant has been disturbed by humans and nature. Prior to park establishment, the small village of fishermen, farmers, and hunters was repeatedly damaged by hurricanes. Paige reports that in 1960, Hurricane Donna destroyed the last of the existing village structures at the site. In addition the Flamingo developed area has previously been excavated and filled to allow for construction of facilities and infrastructure.

Pursuant to 36 CFR 800.4(d)(1), implementing regulations of the National Historic Preservation Act (revised regulations effective January 2001), the National Park Service has determined that there are no historic resources present in the project area of the new Flamingo water treatment plant.

Because of the previously disturbed and filled nature of the sites, there is little probability for historic properties to occur in the project area. Therefore, the park service has determined that there is no need for a comprehensive survey prior to project implementation. However, because the age, depth, and composition of the fill materials at specific sites are not known, cultural resource monitoring will be implemented during any excavation activities. In compliance with 36 CFR 800.13, a qualified archeologist will be present on site to monitor all excavation. In the event that historic resources are encountered, project work will be halted and the discovery process would be initiated.

VISITOR USE AND EXPERIENCE

Affected Environment

From 1998 to 2001 parkwide visitation has consistently been about one million recreational visits. Visitation to the Flamingo developed area is estimated at 150,000 visitors a year. Both boat ramp use and backcountry use increased by approximately 20 percent from 2000 to 2001, from 15,206 to 20,659 and from 7,954 to 9,954, respectively. Reported overnight stays at the lodge and tent camping was approximately the same for 2000 and 2001 with 40,000 and 12,416 overnights each year, respectively. Recreational vehicle overnights were down by 12 percent from 2000-2001 from 16,273 to 14,362.

The Flamingo developed area is comprised of a small visitor center, lodge, restaurant, gift shop, guest cottages, a marina, a maintenance facility, a park/concessioner employee housing area, and a 278 unit campground. A concessioner operates both narrated boat tours and boat rentals (including houseboats, power boats, canoes, and kayaks). These watercraft provide access to Florida Bay and the wilderness waterway.

Impacts of Alternative A: No Action / Continue Current Management

If the no action alternative were to be implemented, the continued deterioration of the wastewater system and resulting frequent repairs would have a moderate, adverse effect on the visitor experience due to cessation of water services, including toilets, during the time of repairs. Although temporary and localized, this service outage can diminish what would have otherwise been a valuable visitor experience. These adverse effects impact the use of campgrounds, cottages, visitor center, concession lodge and marina.

Also, the continuing and frequent repair of the collection system and the annual herbicide spraying of cattails at Eco Pond would have a short- and long-term, negligible to minor, adverse effect on the visitor experience, requiring work crews to manage traffic and temporarily close areas to visitor use. These maintenance activities would continue to create a visual intrusion, detracting from the visitor experience.

During the time that routine or emergency repairs are being made to the wastewater treatment plant, raw sewage has to be stored in the open lagoon adjacent to the plant. This has no effect on visitors because the open lagoon is screened from view by vegetation and located approximately ½ mile from the nearest visitor use area.

The reduction of cattails (herbicide spraying) at Eco Pond would have a long-term, minor, beneficial effect on the visitor experience by maintaining the open character of the pond, allowing unobstructed aquatic/wildlife viewing; thus enhancing the visitor use values associated with this site.

Cumulative Effects. Depending on the values and interests of each visitor, a scene containing developed area infrastructure and

operational activities could have a beneficial or adverse incremental effect. Some might interpret the scene as a desirable indicator of what is necessary to support a welcome recreational development and opportunity. Others might interpret the scene as an encroachment on this tropical landscape scene. Because the main attraction of this isolated development is recreational in nature, as evidenced by the lodge, cottages, campground, and marina, it is unlikely that the scene would generally be considered more than a negligible or minor, adverse, short-term, cumulative effect on the visitor experience, especially when considered in the context of a park that comprises more than a million acres.

Conclusion. The no action alternative would have a moderate, adverse effect on visitor use and experience due to the deteriorating condition of the existing wastewater treatment system and the resulting frequent toilet outages and water shutdowns that would be expected to occur for both the short- and long-term. Continued and increasing maintenance activity associated with the repair of this deteriorating system would have a short- and long-term, moderate, adverse impact on the visitor experience because the collection lines and lift stations are within or visible from primary visitor use areas. The continued use of Eco Pond for effluent discharge would have a long-term, minor, beneficial effect by ensuring that this manmade pond continues to serve as a major visitor aquatic/wildlife viewing area.

Impacts of Alternative B: The Preferred Alternative

The preferred alternative would have a short- and long-term, moderate, beneficial effect on the visitor experience because the upgraded wastewater plant and repair of collection piping would ensure that Flamingo is capable of providing an effective and reliable system that would meet the basic needs of visitors during their stay at the park.

The upgraded wastewater system would require less repairs, which would have short- and long-term, moderate beneficial effect on the visitor experience because there would be less disruption associated with traffic flow, park closures, noise, and visual intrusions associated with maintenance repair activities.

The reduction of cattails (herbicide spraying once a year) at Eco Pond would have a long-term, minor, beneficial effect on the visitor experience by maintaining the open character of the pond, allowing unobstructed aquatic/wildlife viewing; thus enhancing the visitor use values associated with this site.

Cumulative Effects. The wastewater treatment facility is only one element of a large development complex and represents a small but necessary component for the Flamingo operation. Therefore, depending on the values and interests of each visitor, a scene containing developed area infrastructure and operational activities could have a beneficial or adverse incremental effect. Some might interpret the scene as a desirable indicator of what is necessary to support a welcome recreational development and opportunity. Others might interpret the scene as an encroachment on this tropical landscape scene. Because the main attraction of this isolated development is recreational in nature as evidenced by the lodge, cottages, campground, and marina, it is unlikely that the scene would generally be considered more than a negligible or minor, adverse, short-term, cumulative effect on the visitor experience, especially when considered in the context of a park that comprises more than a million acres.

Conclusion. The preferred alternative would have a direct, short- and long-term, moderate beneficial effect on the visitor experience because the new wastewater treatment system would generate less maintenance activity in visitor use areas, reduce visitor exposure to noxious odors, and provide an effective, efficient and reliable means of providing a basic need requirement to ensure a quality visitor experience.

This alternative would have direct, short-term, minor, adverse effects to visitors during the construction of the new wastewater plant due

to the inconvenience of having to use portable toilets and the disruptions to the visitor experience caused by construction activities.

The reduction of cattails (herbicide spraying) at Eco Pond would have a direct, long-term, minor, beneficial effect on the visitor experience by maintaining the open character of the pond, allowing unobstructed aquatic/wildlife viewing.

PARK OPERATIONS

Affected Environment

The superintendent at Everglades National Park is responsible for managing the park, its staff, concessioners and residents, all of its programs, and its relations with persons, agencies, and organizations interested in the park.

Park staff provide the full scope of functions and activities to accomplish management objectives and meet requirements in law enforcement, emergency services, public health and safety, science, resource protection and management, visitor services, interpretation and education, community services, utilities, housing, and fee collection.

Staff duties associated with the wastewater treatment plant include:

- Monitoring of flow rates and effluent quality
- Maintenance of collection system, the plant itself, the lined lagoon, the effluent transmission line, and Eco Pond
- Operation of the maintained facilities

Operation, maintenance, and monitoring of the existing wastewater treatment plant and other maintenance needs in Flamingo require the knowledge, skill, and labor of two full-time licensed operators, one full-time electrician, and one full-time plumber.

Additional burden is placed on the staff due to the age of the existing wastewater treatment system components. The plant and collection system have been in operation since 1973 and the line to Eco Pond since 1978. Between 1973 and 1978, effluent was pumped to sewage lagoons behind the wastewater treatment plant and to a lagoon located near the existing water storage tank. The plant and collection system are in various stages of deterioration and require regular repairs.

Impacts of Alternative A: No Action / Continue Current Management

The wastewater treatment plant was not designed to meet 2010 effluent standards and does not meet, on an annual average basis, existing effluent nitrate standards. (For an overview of current standards and those that must be met by 2010, refer to the "Hydrology and Water Quality" section.)

Some existing plant components are as old as 29 years. Some of these components are in an advanced stage of deterioration, requiring constant attention. Issues of concern include:

- Continual maintenance and repair of the wastewater treatment plant, collection system, and effluent line
- Upkeep of Eco Pond, including herbicide spraying (for cattails)

The added time needed to repair and maintain the system takes staff away from normal duties, and in some cases additional time and resources are required in order to notify the public about repairs taking place. Under the no action alternative, the maintenance intensity of the existing wastewater treatment plant and supporting components would continue to result in these short- and long-term moderate, adverse effects to park operations.

Cumulative Effects. In addition to duties related to the wastewater treatment plant, the operator and support staff operate and maintain the Flamingo water treatment plant. The water plant and its associated distribution

system are also comparatively antiquated and maintenance intensive, adding considerably to park staff workloads. Maintenance, operation, and repair of these plants would continue to pose short- and long-term, moderate, adverse cumulative effects to park operations, and the potential exists for current conditions to worsen as the plants age.

Conclusion. The no action alternative would not result in any changes to existing negligible to moderate, short- and long-term, adverse effects to park operations, brought about by the failure to meet current effluent standards, the over-utilization of current staff, and the age and deteriorated state of the current system. These conditions would continue.

Alternative A would not produce major adverse effects on park operations whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's Master Plan or other NPS planning documents. Consequently, there would be no impairment of park operations as a result of the implementation of Alternative A.

Impacts of Alternative B: The Preferred Alternative

The upgraded wastewater treatment plant would meet or exceed all current Florida Department of Environmental Protection effluent standards as well as the standards that must be met by 2010 (for an overview of current standards and those that must be met by 2010 refer to the "Hydrology and Water Quality" section). This would be considered a short- and long-term, minor to moderate, beneficial effect to park operations compared to the no action alternative.

Operators would need training for the new, more technically demanding equipment. In the short-term, this would cause some difficulty related to the time involved in training and a continued lack of qualified staff while training is occurring. Resultant impacts would be negligible to minor and adverse.

In the long-term, once trained, emphasis would be focused on maintenance of the wastewater treatment plant and less on repairs of the plant and collection system. The preferred alternative would involve less maintenance than the no action alternative because the wastewater plant would be new and the collection system and effluent line to Eco Pond would be rehabilitated as necessary. As such, the components of the wastewater treatment system needing the most attention would be effectively removed, resulting in long-term, moderate beneficial effects to park operations.

Cumulative Effects. Everglades National Park has proposed several relatively large-scale projects, including a water treatment plant upgrade within the Flamingo area, a wastewater upgrade at Pine Island, and a road realignment. The cumulative burden placed on staff as a result of working on and overseeing these projects as well as educating the public about them and why they are necessary would cause negligible to minor, short- and (depending on the extent and length of the project) long-term, adverse effects on to park operations.

These impacts are, however, somewhat offset by the minor to moderate, beneficial effects associated with the removal of these antiquated, maintenance intensive systems and the installation of new ones. In the long-term, park staff would be relieved of many tasks, including constant repair of the systems and notification of the public about repairs, and would be able to focus on providing high quality drinking water and wastewater treatment.

Conclusion. The preferred alternative would result in some short-term, negligible to minor, adverse effects to park operations related to the training of staff on the new, more technically demanding system. Short- and long-term, minor to moderate, beneficial effects would be those associated with the

removal and upgrade of the existing antiquated, maintenance intensive system.

Alternative B would not produce major adverse effects on park operations whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's Master Plan or other NPS planning documents. Consequently, there would be no impairment of park operations as a result of the implementation of Alternative B.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

Sustainability is the result achieved by doing things in ways that do not compromise the environment or its capacity to provide for present and future generations. The NPS Guiding Principles of Sustainable Design (1993) directs NPS management philosophy. It provides a basis for achieving sustainability in facility planning and design, emphasizes the importance of biodiversity, and encourages responsible decisions. The guidebook articulates principles to be used in the design and management of visitor facilities that emphasize environmental sensitivity in construction, use of non-toxic materials, resource conservation, recycling, and integration of visitors with natural and cultural settings.

Continuation of the no action alternative would prolong the discharge of treated effluent that does not meet all current or proposed state water quality criteria for such discharges. This is contrary to the NPS policy of meeting the most stringent of criteria applicable within each park. In addition, the potential exists for discharges to affect resources of the park, including Outstanding Florida Waters. In addition, the potential exists for the public and staff to be exposed to untreated sewage in the event of system failure.

To protect park resources and public health and safety, the park has proposed to replace the existing wastewater treatment system to reduce the quantity of nutrients released into Eco Pond and increase overall system reliability. These actions would reduce the likelihood of effects to natural resources from migration of low quality effluent. In addition the health and safety of staff and visitors would be improved because plant failures would be decreased and employees would have safer access to system components. Such actions would conform to NPS policy mandating protection of resources into perpetuity.

Unavoidable Adverse Impacts

The Flamingo developed area was originally constructed on fill material within the coastal plain. The site includes visitor facilities, park housing, and operations components. Beyond the immediate vicinity, the hydrology and vegetation of the region have been disturbed by large-scale water control and management structures placed throughout the Everglades ecosystem. Neither alternative considered for this analysis would remove or substantially change the effects of these actions on the project area.

CONSULTATION AND COORDINATION

Scoping is the effort to involve agencies and the general public in determining the scope of issues to be addressed in the environmental document. Among other tasks scoping determines important issues and eliminates issues not important; allocates assignments among the interdisciplinary team members and other participating agencies; identifies related projects and associated documents; identifies other permits, surveys, consultations required by other agencies; and creates a schedule which allows adequate time to prepare and distribute the environmental document for public review and comment before a final decision is made. Scoping includes any interested agency or any agency with jurisdiction by law or expertise (including the

Advisory Council on Historic Preservation, the State Historic Preservation Officer, and Indian tribes) to obtain early input.

During scoping for this environmental assessment, the park contacted the Seminole and Miccosukee tribes of Florida via letter on May 24, 2002. Copies of these letters can be found in Appendix B. Copies of this environmental assessment will be sent to the two tribes and also to a group of independent/traditional Miccosukees.

During development of this environmental assessment, the park contacted the national Advisory Council on Historic Preservation in Washington D.C. and the Florida State Historic Preservation Officer regarding the project. A copy of the letter sent to the Florida State Historic Preservation Officer and Advisory Council can be found in Appendix B.

The U.S. Fish and Wildlife Service was contacted by letter regarding this project on May 16, 2002. A copy of this letter requesting verification of threatened and endangered species in the project area is located in Appendix B.

The Florida Department of Environmental Protection was contacted regarding this project on May 24, 2002. This letter may also be found in Appendix B.

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LIST OF RECIPIENTS THAT RECEIVED THE SCOPING BROCHURE

(see Appendix F)

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APPENDIX A

FLOODPLAIN STATEMENT OF FINDING

STATEMENT OF FINDINGS

FOR

EXECUTIVE ORDER 11988 ("FLOODPLAIN MANAGEMENT")

Wastewater System Improvements

Environmental Assessment

Everglades National Park

Recommended:_____

Superintendent, Everglades National Park Date

Concurred: _____

Chief, Water Resources Division, Washington Office, National Park Service Date

Concurred: _____

Southeast Regional Safety Officer, National Park Service Date

Approved: _____

Director, Southeast Region, National Park Service Date

INTRODUCTION

Pursuant to Executive Order 11988 (Floodplain Management), and the National Park Service 1993 Floodplain Management Guideline for implementing the executive order, the National Park Service has evaluated flooding hazards for improvements to the wastewater treatment plant in the Everglades National Park at Flamingo, Florida. This statement of findings describes the proposed action, project site, floodplain determination, and use of floodplain, investigation of alternatives, flood risks, and mitigation for the continued use of the wastewater treatment plant within the 100-year floodplain.

Proposed action

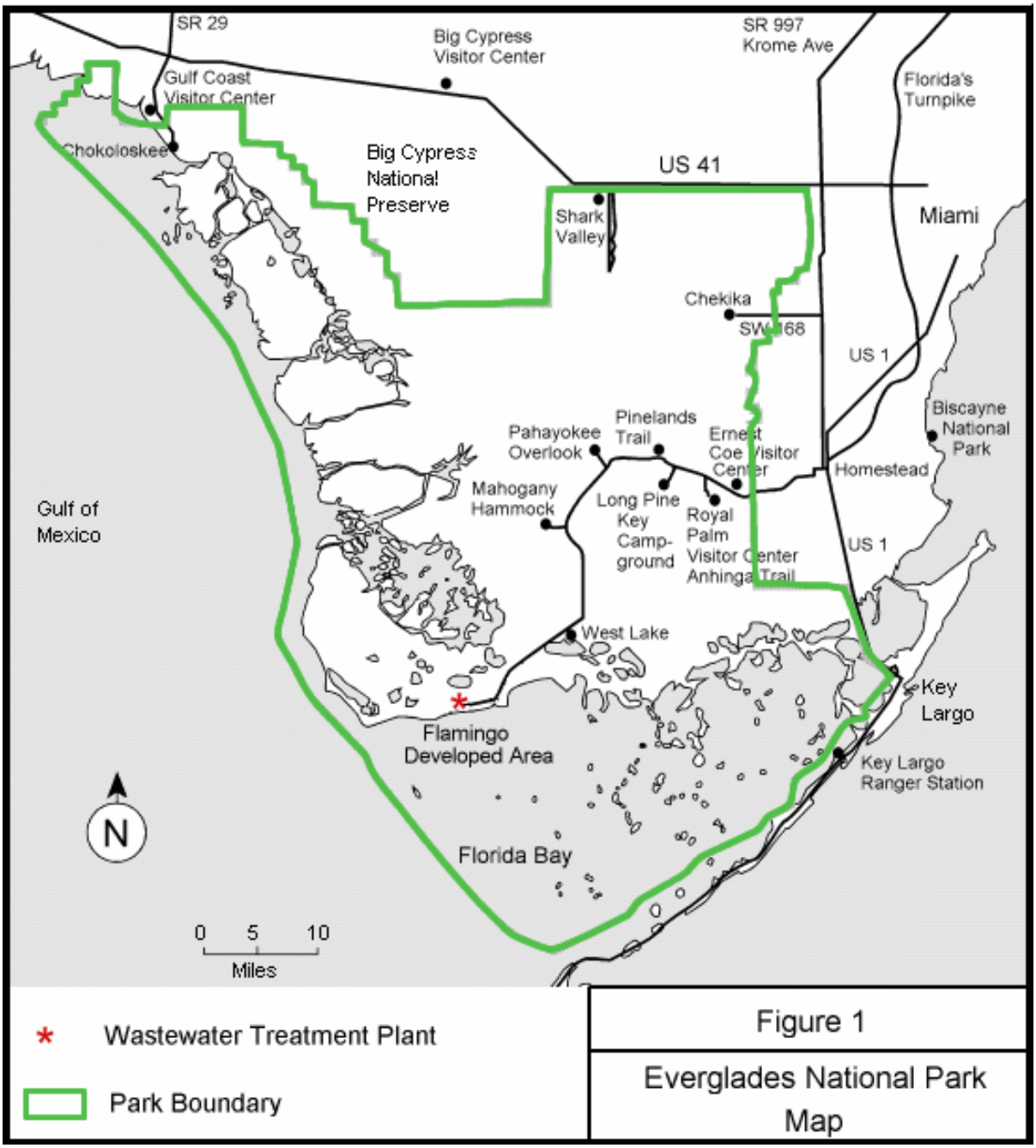
The National Park Service proposes to improve the existing wastewater treatment facilities and several of the force mains and pump stations that serve the Flamingo developed area of Everglades National Park for the purpose of providing sanitary sewer service. The project involves replacing the existing wastewater treatment system with a new dual train packaged system, and using the existing pump stations, percolation ponds, and distribution pond (Eco Pond). The existing wastewater treatment building and sludge tank facility will be demolished and removed. Wastewater is obtained and transmitted to the treatment plant by 17 pump stations connected to more than 24,000 feet of sewer force main lines. Force mains and pump stations are to be upgraded as needed. An existing pump station and 7,900 foot treated effluent pipe would continue to be used to discharge into an existing discharge pond. The new wastewater treatment system would provide an effective, efficient and reliable wastewater treatment system compliant with operating requirements and regulations of the Florida Department of Environmental Protection.

Project Site

Everglades National Park is located in Monroe County, Florida 50 miles southwest of Miami and covers 1,509,000 acres of the southernmost tip of Florida (Figures 1 and 2). The project area includes a series of pump stations and sewer main pipeline, an existing wastewater treatment plant site and a discharge pond site. The wastewater treatment plant and percolation ponds are located in the Flamingo development area zone less than ¼ mile north of route 9336. The sewer mains are located inside the park's development area zone extending 1 mile south of the wastewater treatment facility. Treated wastewater is discharged from the wastewater treatment system and is piped through a 6-inch pipe to the discharge pond located at the second project site about 1.5 miles west of the treatment plant.

Floodplain Determination

Low elevation and broad areas of very low relief less than 10 feet above sea level characterize topography throughout the park. The wastewater treatment plant, percolation pond, sewer mains, pump stations, and discharge lines and pond are located within the coastal zone 100-year floodplain (Figure 3). Flood Insurance Rate Map (12087C 750 G March 3, 1997) shows the wastewater treatment plant is located in the AE-zone. In the coastal floodplain the AE-zone is further classified into base flood elevations derived from hydraulic analysis used for structural engineering designs. The wastewater treatment plant area and the percolation ponds are located in the AE 9-zone. The existing discharge pond is located in the AE 10-zone. Lands immediately adjacent and 2000 feet coastward of the AE 9-zone are located in the VE-zone and are subject to three-foot waves and storm surges. Current sewer mains are located in both the VE 7-zone and the VE 3-zones. High-hazard areas are a Class III action as defined by the National Park Service Floodplain Management Guidelines (National Park Service 1993).


SR 29
Big Cypress Visitor Center
SR 997 Krome Ave
Gulf Coast Visitor Center
Florida's Turnpike
Chokoloskee
Big Cypress National Preserve
US 41
Shark Valley
Miami
Chekika
SW 168
US 1
Biscayne National Park
Pahayokee Overlook
Pinelands Trail
Ernest Coe Visitor Center
Homestead
Mahogany Hammock
Long Pine Key Camp-ground
Royal Palm Visitor Center
Anhinga Trail
US 1
Gulf of Mexico
West Lake
Key Largo
Flamingo Developed Area
Key Largo Ranger Station
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Florida Bay
0 5 10
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* Wastewater Treatment Plant
Park Boundary
Figure 1
Everglades National Park Map

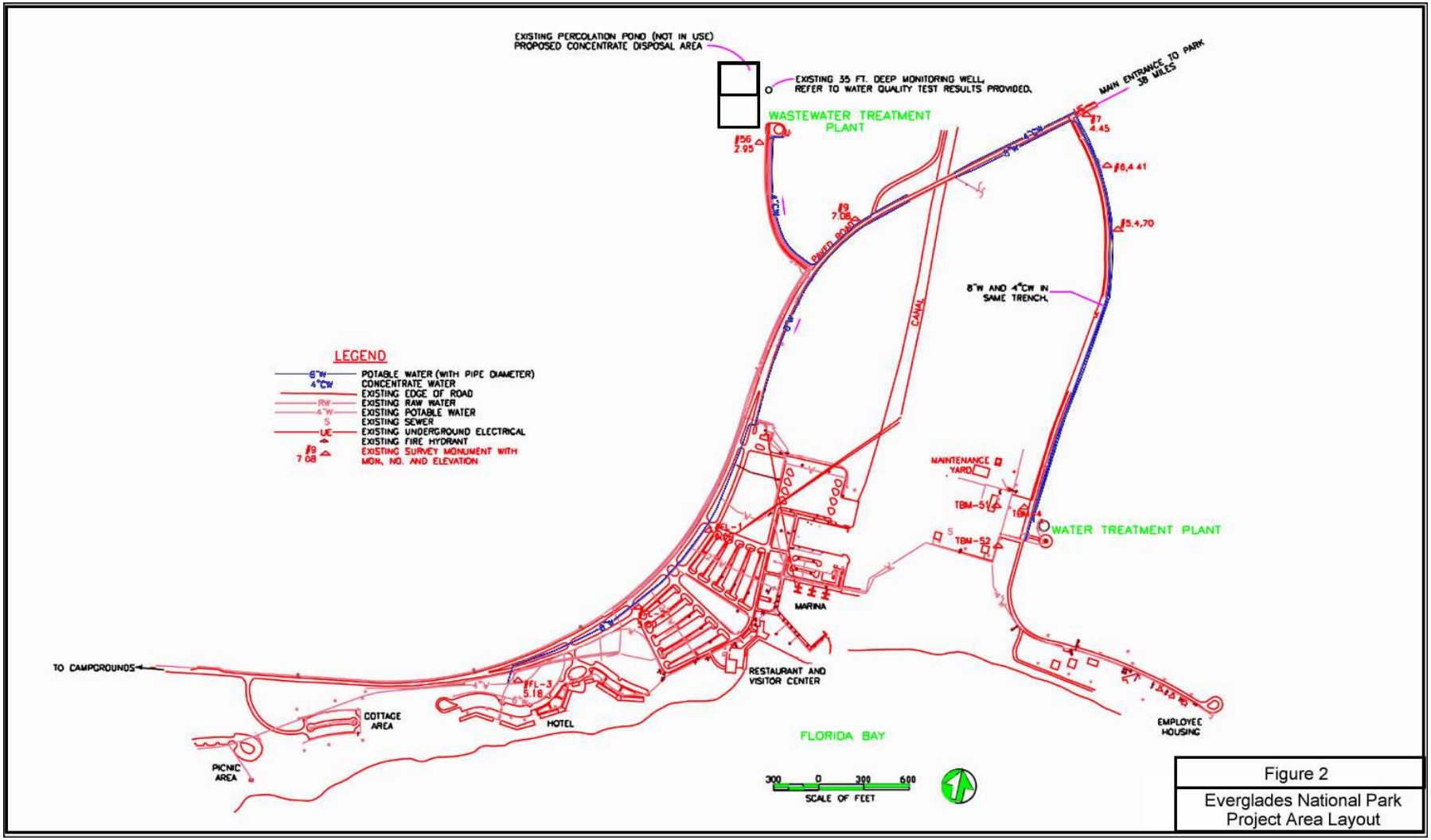

Figure 2

Everglades National Park
Project Area Layout

Facilities located in these coastal high-hazard areas are required to meet South Florida Building Codes and Monroe County floodplain management standards.

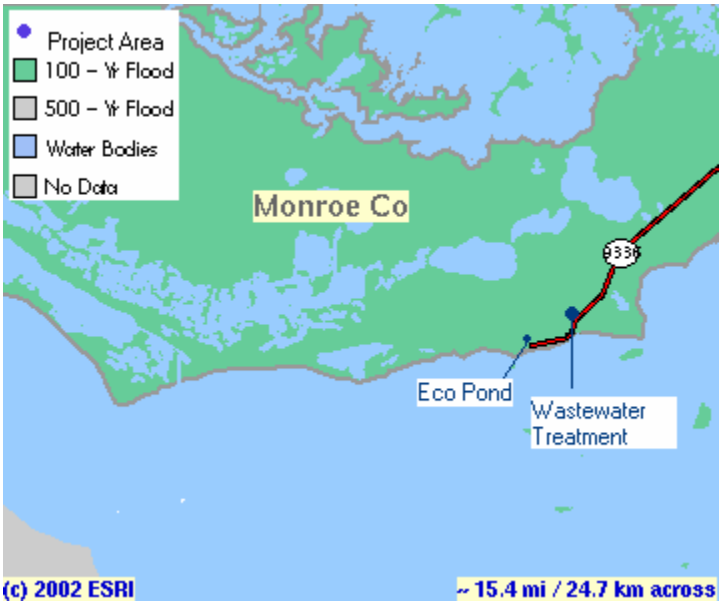

Figure 3. Location of 100-year floodplain.

Use of the Floodplain

Since the establishment of Everglades National Park in 1947, the parks mission has been to preserve resources inclusive of hydrological conditions within the park and the south Florida ecosystem. Subsequent agricultural and residential development surrounding the park has increased over the years and substantially changed the hydrology. South Florida's infrastructure of canals, levees and water control structures were created to manage and drain excess water throughout agricultural and developed areas during the wet season. Coastal canals are kept at low levels during the wet season to store and convey floodwaters. The canals and levees are managed to protect developed and agriculture areas surrounding the park from flooding and to control water elevations.

The existing wastewater treatment site has historically housed and provided wastewater treatment services for the developed area of the park since the late 1970s. The site is adequately sized to add the new wastewater structures. Considering the existing park infrastructure, limited availability of developed land and the location of existing park facilities, the most practicable site alternative is to install the new wastewater treatment facility at the existing wastewater treatment site. Utilizing the existing percolation ponds, discharge lines and pond, and replacement of force mains and pump stations on an as needed basis minimizes disturbance of the floodplain.

The risk of flooding is reduced by constructing a new wastewater treatment building and elevating it above the base flood elevation. An existing sludge tank will be replaced with a more compact dual train packaged wastewater treatment plant and the rim of the holding tank(s) elevated above the base flood elevation. By reducing the existing building footprint by removing the outdated structures and minimizing the degree of disturbance within the floodplain the action would attain the widest range of beneficial uses of the environment, biological, visitor safety and enjoyment, and cultural resource protection without degradation of park resources. There would be a higher level of health and safety for

visitors and park employees by providing dependable wastewater treatment. Replacement of leaky sewer mains would also reduce the impact caused by raw waste seeping into groundwater. Although the action would potentially disturb some 24,000 linear feet of 100-year floodplain to replace sewer mains, surface grades would be restored. No substantial increase in impermeable surface resulting in surface runoff would occur therefore there would be a negligible, direct, short-term adverse impact to the floodplain.

Investigation of Alternatives and Flood Risk

Because the entire park lies in the 100-year floodplain park facility development, rehabilitation, or reconstruction in the floodplain has historically been the only practicable alternative. Alternatives considered for the wastewater treatment improvements analyzed to determine if they involve less flood risk include: connecting to an existing municipal wastewater system, replacement of outdated facilities while abandoning but not removing old structures, and various effluent discharge options such as deep well injection, pumping to a percolation pond, wastewater irrigation and discharge into Florida Bay.

The National Park Service considered connecting with the municipal wastewater system located in Homestead, Florida. This alternative would extend a wastewater transmission main more than 60 miles and require construction of additional pump stations at on-site and off-site locations north east of the park. Extending the main increases the disturbance within natural areas of regional importance. It would also encourage additional commercial and residential development on agriculture lands adjacent to the park. This action would require more construction within the 100-year floodplain thereby increasing the risk of structural damage caused by flooding and reducing efficiency by increasing the service delivery time for wastewater treatment systems.

Constructing a new wastewater treatment facility to replace outdated facilities and abandoning but not demolishing and removing the outdated buildings would increase the impervious area on the site. New structures would be elevated above base flood elevation to reduce flood risk but an efficient wastewater operation would not be provided over the long term because sewer mains would be repaired or replaced as needed. Abandoned buildings would continue to deteriorate and would remain a potential flood hazard by possibly contributing to flood debris. Maintenance and operations may be inconsistent because repairs would be conducted on an as needed basis. Achieving federal, state and local wastewater standards would not be consistent. This action would increase flood risks by continued exposure of the deteriorated buildings and pipes to flood waters. In addition inundation could weaken the sewer main pipes further causing seepage of raw sewage. Flood damage risks would increase through loss of function and time necessary to restore a fully functioning wastewater supply.

Various effluent discharge alternatives would involve modifying either surface or groundwater hydrology within the floodplain. These alternatives would also require new construction, expansion, or retrofitting of the existing percolation pond and further disturbance of the floodplain from re-routing of discharge lines. Additional maintenance of the deteriorating and leaking force mains and pump stations would be needed to prevent leaching of sewage into the groundwater and floodplain while pumping the sewage to the wastewater treatment plant.

Flood Risk of Project Site

Everglades National Park is located in a coastal high-hazard area and is subject to high groundwater levels, flooding and tides. High-risk coastlines are those that have low coastal elevations, erodible substrate and high wave and tide energy. Hydrologic conditions in the park are influenced by both weather and the water management operations of the central and south Florida project. The project site

would be subject to inundation from the less frequent 1-percent-annual-chance coastal flood event. During small storm events rainwater generally drains from larger uplands and surrounding areas through Shark River and Taylor Slough's into Florida Bay. Surface drainage in the park during the less than 10-year event is controlled by the natural wetlands and to a lesser extent; Buttonwood Canal help to divert drainage around the Flamingo developed zone. During larger storm events tides and wind tides increase, groundwater levels rise, canals would fill and portions of the Flamingo developed area may be inundated. Storm surge elevations from a storm event with a 10-year recurrence interval were estimated to reach 3 to 4 feet for the south Florida coast (Anders *et al.*, 1989).

The wastewater treatment plant area is set back from the coastal area at elevations ranging from 5 to 7 feet providing some protection from large waves caused by coastal storm surges. Elevations in the vicinity of the treated wastewater discharge pond range from 4 to 5 feet above sea level. Severe coastal storms do not occur every year and risk for storm surge elevations higher than 4 to 5 feet are low. Storm tide elevations along the southwestern coast during the most recent severe storm Hurricane Andrew in 1992 ranged from 4 to 5 feet at Flamingo and did not flood the park's developed areas.

Larger tropical storm events particularly hurricanes may expose the wastewater treatment plant, discharge pond and pipeline, pump stations and sewer mains in the immediate project area to coastal flooding and high velocity winds that could be threatening to life and property. Wind velocities combined with storm tides would be capable of increasing tidal elevations anywhere from 2 to 5 feet for a category 1 event to close to 7 feet above the norm for a category 2 event and wind velocities up to 100 miles per hour. Coastal flooding combined with waves can impact structures, damage system pipes, tanks, and pump stations. Flooding of wastewater ponds or sludge tanks could expose personnel and public to disease and scattered toxins or chemicals and can contaminate the potable water supply.

Assessing potential impacts from a coastal hazard involve evaluating risk of exposure of life and property to a flood event and consequences of that exposure. For Everglades National Park this requires consideration of risk and protection of visitors, park staff, concessioner, property, and essential infrastructure to coastal flooding.

Public visitors and most park staff and concessioner's staff other than maintenance crews would not typically utilize the wastewater treatment plant area thereby reducing risk to life. Implementation of the Everglades National Park Hurricane Plan further minimizes potentially life-threatening flood hazards by providing a park-wide warning and evacuation plan during the hurricane season (June 1 to November 30). The major flood risks associated with a service property such as wastewater and sewer systems include backup of sewage into buildings due to facility failure, physical damage to the pipes, pump stations and holding tanks, and contamination of water and surrounding wetlands by sewage.

Storm duration is the main factor that influences the risk of exposure to people and property. Tropical storm tracking, position estimates, and intensity forecasts are conducted several times daily. Coastal and low-lying escape routes flood 2-4 hours before arrival of the hurricane center. Intensity forecasts use surface wind and radial extent in quadrants relative to the storm center to predict when the storm will hit land. Warnings are initiated within 72 hours before landfall of the pending tropical storm and once enacted the evacuation is park-wide.

The wastewater treatment facilities are in close proximity to Buttonwood Canal and are afforded some flood protection by being elevated above the canal and base flood elevation. The new wastewater treatment plant laboratory and equipment building would be adequately anchored by columns elevated 11 feet above grade and include protection against high winds in accordance with South Florida Building Code and the Monroe County Code of Ordinances Article VII – Land Use Districts, Division 6

Floodplain management standards. Electrical and mechanical equipment would also be elevated and protected beyond base flood elevation.

MITIGATIVE ACTIONS

The proposed action would reduce the overall developed footprint in the 100-year floodplain. Replacement of deteriorated sewer mains would reduce direct disturbance of the floodplain by removing the need for long-term maintenance and stop the leaching of sewage into groundwater. However, because the wastewater treatment plant and discharge pond is located in a high hazard area the risk to property can be reduced through mitigation but cannot be eliminated.

In accordance with EO 11988 flood protection will be provided for the new wastewater treatment building by elevating and securing the structure on piles above flood elevation level rather than by fill. The raw influent discharge pipe would be elevated above the rim of the treatment tank(s) and designed to discharge above the base flood elevation into the tank. Existing pump station valves are located below ground and any sewer mains to be replaced will be properly embedded to minimize damage from surface erosion, debris and flooding.

During flooding, pump stations are shut down. Valves will be protected from debris impact, velocity flow, wave action and erosion. Treatment plant pump stations are equipped with an emergency mobile gasoline generator powered connector and pump-around piping in the event of pump failure.

To improve the protection of park property a wastewater treatment plant hurricane hazard plan will be developed. This plan will address pre and post hurricane preparedness measures in accordance with the *Hurricane Preparedness for Domestic Wastewater Treatment Plants* guidelines established by the Florida Department of Environmental Protection.

The National Park Service will continue to operate these facilities using the Everglades National Park Hurricane Plan, an operational hazard implementation plan that lowers the threat to life and property. This plan is coordinated with the Dade, Collier and Monroe County Departments of Emergency Management. The plan is reviewed and updated annually to ensure maximum human safety.

TABLE 4: MITIGATION MEASURES AND BEST MANAGEMENT PRACTICES

Potential Adverse Effect	Mitigation Measure or Best Management Practice
Direct effects from construction activities	Fencing of all construction areas to confine potentially adverse activities to the minimum area required for construction. All protection measures would be clearly stated in the construction specifications, and workers would be instructed to avoid conducting activities beyond the fenced construction zone.
Erosion resulting from construction-related surface disturbance	Standard erosion control measures such as sand bags would be used to minimize soil erosion. Erosion barriers would be inspected and maintained regularly to ensure effectiveness
Construction would affect areas previously undisturbed	Construction activities would take advantage, where possible, of sites where previous disturbance has already had adverse effects.
Contamination of soil by petrochemicals from construction equipment and maintenance of wastewater treatment system	Areas used for equipment maintenance and refueling would be minimized and surface runoff in these areas would be controlled. Equipment would be checked frequently to minimize leaks and potential contamination. All chemicals used in the wastewater treatment process would be transported, stored, and used following federal, state, and local regulations and standards.
Direct effects from construction and operation of rehabilitated wastewater system on threatened and endangered species, wildlife, and habitat	Pre-construction surveys would be conducted to avoid nesting sites of the federally listed, endangered American crocodile and the osprey (Florida species of special concern). The Park would use its best professional judgment in applying standard protection measures for the Eastern indigo snake (see Appendix J).
Direct effects from construction and operation of rehabilitated wastewater system on the visitor experience and park staff	To lessen adverse effects on the visitor experience, construction information would be posted in strategic locations and made available on the park's website. Construction would utilize a rotation system to minimize disruption of visitor access and use of the Flamingo developed area. Where possible, all construction activities would be timed to avoid high visitor use periods.
Discovery of unknown archeological resources or human remains	If previously undiscovered archeological resource are unearthed, work would be stopped in the area of any discovery and the park would consult with the National Park Service Southeast Archeological Center, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation, as appropriate. Because the project site is not in a high probability area, it is unlikely that any cultural resources would be encountered or impacted.

Summary

This proposed action constitutes the continuation of a risk to life and property reduced by implementation of sustainable flood mitigation designs and park hurricane hazard plan. The National Park Service wastewater treatment plant improvements will continue to be operated in a coastal flood hazard area. No fill, alteration of sand beach, or wetlands that would increase potential flood damage would be needed for structural support of the new building and treatment tank facility, discharge pipe or the replacement of portions of the existing sewer mains. The park will continue to implement the Everglades National Park hurricane hazard plan to protect and lower the risk to life and property during tropical storm season from June to November. This plan will be reviewed and updated to incorporate hurricane preparedness measures for wastewater treatment plants. Flood losses will be reduced by ensuring that new construction and improvements in flood prone areas is protected from flood damages.

By retrofitting existing facilities and minimizing and restoring any land disturbance within the floodplain, the project continues to protect local and regional areas of unique natural beauty, wetlands, and wildlife and avoids adverse environmental impacts to the maximum extent.

Finally, the project would provide effective life essential wastewater treatment and efficient operations in compliance with state and local water quality standards.

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APPENDIX B

COMPLIANCE/CORRESPONDENCE

PUBLIC SCOPING FOR THE FLAMINGO WASTEWATER IMPROVEMENTS ENVIRONMENTAL ASSESSMENT

Between May 16th –24th, 2002, scoping brochures for the Flamingo Potable Water and Wastewater Improvement Projects were mailed or emailed to approximately 600 individuals, organizations and agencies. The brochures were posted and distributed at the Flamingo developed area, park headquarters, and placed on the Everglades National Park website at http://www.nps.gov/ever/planning. A press release announcing the release of the brochures and inviting public participation in the planning process was emailed to South Florida media outlets on May 17th.

The brochures announced the intent to prepare environmental assessments to address alternatives for improving the drinking water and wastewater treatment systems at the Flamingo developed area. They described preliminary alternatives for each project, outlined preliminary resource considerations, and identified opportunities for the public to participate in the environmental assessment process. The brochures also requested that interested persons or organizations submit their views and/or concerns regarding these projects to the National Park Service.

Public scoping workshops on the drinking water and wastewater projects were held at the Flamingo Restaurant on May 29th and at the Florida City Hall on May 30, 2002. The goal was to solicit public input regarding the project alternatives and environmental issues to be addressed in the environmental assessments. Park staff were on-hand to listen to the public's views of the current systems, and to identify concerns, issues, and potential solutions for future management. Comments were received at the workshop, by mail, and via the Internet. A total of 15 comment letters/e-mails were received.

Summary of Issues and Concerns about the Flamingo Wastewater System Improvements Project

The issues and concerns identified by the respondents fell into 5 broad categories: 1) NPS environmental leadership/sustainability issues, 2) comments on current management and preliminary alternatives, 3) construction effects, 4) concerns about Eco Pond, and 5) consultation/coordination

NPS Environmental Leadership/Sustainability Issues

- "Everglades National Park is not just a facility, it is a bellwether and should be a leader in all things environmental. We should take this opportunity to create a showcase of how to do it right and make that showcase available to the public. … Let's be leaders in new environmental technologies, not low cost followers!" (private individual)

- "My greatest concern is that these improvements will only meet the minimum standards for phosphorous content. Just thirty miles away, much higher standards will be in effect (Pine Island). I can't understand why a completely connected and interdependent ecosystem would be divided and addressed differently? Is one part of the Everglades more environmentally sensitive than another? Why would the national park not do its best to protect and preserve the ecosystem in the most pristine state possible? I believe it's because we can get away with much less. If this will be the case, then shame on us. Everglades National Park, of all parks, should be trying to do the right thing. We are holding ourselves up to the world as an example of large-scale restoration efforts. But what about the less glamorous aspects of restoration? Everglades National Park can show millions that they chose to do more than they had to do; that they are providing cleaner water [to Eco Pond] than they had to provide; that they are environmental leaders, not followers always trying to catch-up and do just enough to get by. This would be not only good for the ecosystem, but good for the image of the

National Park Service. And it would be something to be proud of." (park employee writing as private individual)

Current Management/Capacity Issues and Preliminary Alternatives

- Glad that Park is finally getting a chance to perform capital improvements (private individual)

- "…integrate the wastewater system into the plans and use that for irrigation and toilets at the motel and campgrounds… consider other possibilities for toilets, composting etc." (private individual)

- Water and wastewater projects should be combined as a continuous system. "A way to improve the scoping would be to do a cradle to grave mass balance on the solids of both the potable water system and the wastewater system. Give us the whole story of how many pounds per year of what are removed, and where they eventually end up." (private individual)

- "The two Flamingo projects are clearly connected and would BOTH be significantly affected by serious consideration of water conservation measures including re-circulation and re-processing facilities. Please include and develop another alternative in both EAs (or combine them). The new alternative(s) would be to maximize water conservation and re-use so as to reduce the need for water production (reduce the gallons needed) and reduce the need for wastewater treatment (reduce gallons treated). Such an alternative would follow NPS management policies calling for sustainable facilities, calling for the NPS to lead by example in management and facilities." (private individual)

- Existing systems are inadequate (Flamingo resident, private individuals)

- Park has delayed action too long on this systems (private individual)

- "Alternative 1: No Action would be unacceptable. Alternative 2: Construction of a New WWTP, begins to address the problem, however the scope of action is too narrow. Alternative 2 proposes that "treated effluent would continue to be discharged into a percolation pond (Eco Pond.)" Focusing on an alternative that would offer discharge clean enough to eliminate the need for a percolation pond would demonstrate the environmental leadership that should be the hallmark of National Park Service stewardship. Elimination of the need for a percolation pond would contribute to a clean environment, remove a potential health hazard of people exposed to treated effluent and redistribute birds to a natural habitat. Continuation of the need for a percolation pond in the Flamingo area promotes an unnatural bird habitat similar to the unnatural bear habitats eliminated at other National Park Service sites. Thus an Alternative 3 of going beyond 2010 compliance into outstanding environmental leadership would be the optimum choice." (park employee)

- Suggests the park consider the use of a Living Machine (http://www.livingtechnologies.com), "a natural systems approach to wastewater treatment… incorporate helpful bacteria, plants, snails, and fish that thrive by breaking down and digesting organic pollutants… does not typically require the use of chemicals that are harmful to the environment…is designed to conserve and recycle wastewater."

Construction Effects

- Request that construction be done during the summer months to avoid visitor inconvenience. (private individual)

- Document should describe mitigation of adverse effects during construction. Wants to know what system will be used during construction (U.S. Bureau of Indian Affairs)

- Notified Park that if the navigable channel into the Flamingo area will be impacted by construction, further consultation is needed (U.S. Coast Guard)

- Will Park exceed the current development footprint with proposed alternatives? (U.S. Fish and Wildlife Service)

Impacts to Eco Pond

- Wants Park to describe a new water source to the pond, if the present system is cut off

- Recommends treating effluent to a point where need for Eco Pond is eliminated, potential health hazards are eliminated, and birds could be redistributed to a natural environment (Park employee)

- Water sent to Eco Pond should be as clean as possible for the wildlife that goes there (Flamingo resident)

- "We would want any new plant to continue to discharge into Eco Pond (as the scoping document promises), as that is one of the best birding spots in all of south Florida (private individual)

- "People visit Everglades National Park from all over the world, and many are visiting because of the birds in particular. Eco Pond has become a birding hotspot. Many species of birds nest, roost, and feed in Eco Pond and the surrounding vegetation. Yes, it is a percolation pond, but it is obviously much more. We should be providing the wildlife that has come to depend on the waters of Eco Pond with the cleanest water possible, cleaner than the minimum standards." (park employee writing as private individual)

- Continuation of the need for a percolation pond in the Flamingo area promotes an unnatural bird habitat similar to the unnatural bear habitats eliminated at other National Park Service sites (park employee)

Consultation and Coordination

- Has the park consulted with the Miccosukee and Seminole Indian Tribes? (U.S. Bureau of Indian Affairs)

United States Department of the Interior

NATIONAL PARK SERVICE
Everglades National Park
and
Dry Tortugas National Park
40001 State Road 9336
Homestead, Florida 33034-6733

REPLY REFER TO:
D1815

MAY 24 2002

Mr. Don Klima
Advisory Council on Historic Preservation
Old Post Office Building
1100 Pennsylvania Avenue, NW, Suite 809
Washington, DC 20004

Reference: Re: Everglades National Park, Scoping for Environmental Assessments for Proposed Flamingo Potable Water System Improvements and Proposed Flamingo Wastewater System Improvements

Subject: Section 106 Compliance

Dear Mr. Klima:

The National Park Service (NPS) has initiated planning to upgrade the Flamingo potable water system and the Flamingo wastewater system, both located within Everglades National Park, Monroe County, Florida. The goal of these projects is to provide safe, reliable drinking water and wastewater services for park visitors and employees in an environmentally sound manner. The NPS will comply with the National Environmental Policy Act by preparing an environmental assessment for each project. Scoping brochures with maps and project information are enclosed for your review.

Although we are just beginning to gather information for these projects, we believe that their eventual implementation may affect properties that may be eligible for inclusion in the National Register of Historic Places. Therefore, we would like to invite your office to participate in the development of this planning effort in accordance with 36 CFR 800, and with the 1995 Servicewide Programmatic Agreement among your office, the National Conference of State Historic Preservation Officers, and the National Park Service.

This letter also is to notify your office that we plan to use the environmental assessment process to accomplish compliance for both Section 106, in accordance with the National Historic Preservation Act, as amended, and the National Environmental Policy Act (as described in 36 CFR 800.8 (a-c)), and to analyze potential effects from proposed implementation of this plan.

We would appreciate your careful consideration of the enclosed materials. As soon as the draft environmental assessments are completed, we will send them to you for your

review and comment. We look forward to your participation in the planning process. We believe that it will ensure that cultural resources are adequately considered during the planning process.

Should you have any questions or desire additional information, please contact Brien Culhane, Chief, Planning and Compliance at Everglades National Park, by calling 305-242-7717 or by email at brien_culhane@nps.gov.

Sincerely,

Maureen Finnerty
Superintendent

Enclosures

United States Department of the Interior

NATIONAL PARK SERVICE
Everglades National Park
and
Dry Tortugas National Park
40001 State Road 9336
Homestead, Florida 33034-6733

REPLY REFER TO:
D1815

MAY 24 2002

Mitchell Cypress, Acting Chairman
Seminole Tribe of Florida
6300 Stirling Road
Hollywood, Florida 33024

Reference: Re: Everglades National Park, Scoping for Environmental Assessments for Proposed Flamingo Potable Water System Improvements and Proposed Flamingo Wastewater System Improvements

Reference: Consultation Regarding Ethnographic Resources

Dear Chairman Cypress:

The National Park Service (NPS) has initiated planning to upgrade the Flamingo potable water system and the Flamingo wastewater system; both located within Everglades National Park, Monroe County, Florida. The goal of these projects is to provide safe, reliable drinking water and wastewater services for park visitors and employees in an environmentally sound manner. The NPS will comply with the National Environmental Policy Act by preparing an environmental assessment for each project. Scoping brochures with maps and project information are enclosed for your review.

Information gathering for these projects is just beginning and we want to be sure that they will not affect ethnographic resources. Ethnographic resources are defined by the National Park Service as any natural or cultural resource, landscape, or natural feature which is linked to the traditional practices, values, beliefs, history, and/or ethnic identity of a cultural group or groups.

We are sending notification of these projects to your office to help ensure that they will not negatively impact ethnographic resources with a cultural affinity to members of your tribe. We are hoping you will examine the enclosed map and descriptions of the proposed work. If you feel there may be resources that may be impacted by the projects, please do not hesitate to contact me at 305-242-7710 to discuss any concerns you may have. We would appreciate knowing of any initial concerns by June 10, 2002.

As soon as the draft environmental assessments are completed, we will send them to you for your review and comment. We look forward to your participation in the planning process. We believe that it will ensure that ethnographic resources are adequately considered during the planning process.

Thank you for your time and interest in these important projects.

Sincerely,

Maureen Finnerty
Superintendent

Enclosures

United States Department of the Interior

NATIONAL PARK SERVICE
Everglades National Park
and
Dry Tortugas National Park
40001 State Road 9336
Homestead, Florida 33034-6733

REPLY REFER TO:

MAY 24 2002

D1815

Billy Cypress, Chairman
Miccosukee Tribe of Indians of Florida
Mile Marker 70, US. 41, Tamiami Trail
Miami, FL 33194

Reference: Re: Everglades National Park, Scoping for Environmental Assessments for Proposed Flamingo Potable Water System Improvements and Proposed Flamingo Wastewater System Improvements

Subject: Consultation Regarding Ethnographic Resources

Dear Chairman Cypress:

The National Park Service (NPS) has initiated planning to upgrade the Flamingo potable water system and the Flamingo wastewater system; both located within Everglades National Park, Monroe County, Florida. The goal of these projects is to provide safe, reliable drinking water and wastewater services for park visitors and employees in an environmentally sound manner. The NPS will comply with the National Environmental Policy Act by preparing an environmental assessment for each project. Scoping brochures with maps and project information are enclosed for your review.

Information gathering for these projects is just beginning and we want to be sure that they will not affect ethnographic resources. Ethnographic resources are defined by the National Park Service as any natural or cultural resource, landscape, or natural feature which is linked to the traditional practices, values, beliefs, history, and/or ethnic identity of a cultural group or groups.

We are sending notification of these projects to your office to help ensure that they will not negatively impact ethnographic resources with a cultural affinity to members of your tribe. We are hoping you will examine the enclosed map and descriptions of the proposed work. If you feel there may be resources that may be impacted by the projects, please do not hesitate to contact me at 305-242-7710 to discuss any concerns you may have. We would appreciate knowing of any initial concerns by June 10, 2002.

As soon as the draft environmental assessments are completed, we will send them to you for your review and comment. We look forward to your participation in the planning process. We believe that it will ensure that ethnographic resources are adequately considered during the planning process.

Thank you for your time and interest in these important projects.

Sincerely,

John C. Dejarnette for

Maureen Finnerty
Superintendent

Enclosures

United States Department of the Interior

NATIONAL PARK SERVICE

Everglades National Park
and
Dry Tortugas National Park
40001 State Road 9336
Homestead, Florida 33034-6733

IN REPLY REFER TO:
D1815

May 24, 2002

Mr. Richard W. Cantrell
Director, District Management
Florida Department of Environmental Protection
South District
2295 Victoria Avenue, Suite 364
Fort Myers, FL 33901-3881

Re: Everglades National Park, Scoping for Environmental Assessments for Proposed Flamingo Potable Water System Improvements and Proposed Flamingo Wastewater System Improvements

Dear Mr. Cantrell:

The National Park Service is preparing environmental assessments to address options for improving the Flamingo potable water system and the Flamingo wastewater system, both located within Everglades National Park, Monroe County, Florida. The goal of these projects is to provide reliable water and wastewater treatment facilities that meet applicable treatment standards. Scoping brochures with background information and project descriptions are enclosed for your review.

Although more specific comments will be solicited during the permit coordination process and during review of the draft environmental assessments, we request that you review the enclosed information and provide us with any general comments you consider pertinent at this time. We would appreciate receiving your initial comments by June 10, 2002. Your comments can be sent to me at the address above, or by email at EVER_Flamingo_WW@nps.gov.

We look forward to working cooperatively with you on the planning and implementation of these projects. Should you have any questions about the planning process, please call me at 305-242-7717.

Sincerely,

Brien F. Culhane, AICP
Chief, Planning and Compliance

Enclosures

United States Department of the Interior

NATIONAL PARK SERVICE
Everglades National Park
and
Dry Tortugas National Park
40001 State Road 9336
Homestead, Florida 33034-6733

REPLY REFER TO:
D1815

MAY 24 2002

Ms. Janet Snyder Matthews
State Historic Preservation Officer
Division of Historical Resources - Bureau of Historic Preservation
Compliance and Review Section
R.A. Gray Building
500 S. Bronough Street
Tallahassee, FL 32399-0250

Reference: Re: Everglades National Park, Scoping for Environmental Assessments for Proposed Flamingo Potable Water System Improvements and Proposed Flamingo Wastewater System Improvements

Subject: Section 106 Compliance

Dear Ms. Matthews:

The National Park Service (NPS) has initiated planning to upgrade the Flamingo potable water system and the Flamingo wastewater system; both located within Everglades National Park, Monroe County, Florida. The goal of these projects is to provide safe, reliable drinking water and wastewater services for park visitors and employees in an environmentally sound manner. The NPS will comply with the National Environmental Policy Act by preparing an environmental assessment for each project. Scoping brochures with maps and project information are enclosed for your review.

Although we are just beginning to gather information for these projects, we believe that their eventual implementation may affect properties that may be eligible for inclusion in the National Register of Historic Places. Therefore, we would like to invite your office to participate in the development of this planning effort in accordance with 36 CFR 800, and with the 1995 Servicewide Programmatic Agreement among your office, the National Conference of State Historic Preservation Officers, and the National Park Service.

This letter also is to notify your office that we plan to use the environmental assessment process to accomplish compliance for both Section 106, in accordance with the National Historic Preservation Act, as amended, and the National Environmental Policy Act (as described in 36 CFR 800.8 (a-c)), and to analyze potential effects from proposed implementation of this plan.

We would appreciate your careful consideration of the enclosed materials. As soon as the draft environmental assessments are completed, we will send them to you for your review and comment. We look forward to your participation in the planning process. We believe that it will ensure that cultural resources are adequately considered during the planning process.

Should you have any questions or desire additional information, please contact Brien Culhane, Chief, Planning and Compliance at Everglades National Park, by calling 305-242-7717 or by email at brien_culhane@nps.gov.

Sincerely,

for Maureen Finnerty
Superintendent

Enclosures

United States Department of the Interior

NATIONAL PARK SERVICE

Everglades National Park
and
Dry Tortugas National Park
40001 State Road 9336
Homestead, Florida 33034-6733

IN REPLY REFER TO:

D1815

May 16, 2002

Mr. Jay Slack
Field Supervisor
South Florida Office
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32960

Dear Mr. Slack:

Re: Everglades National Park, Scoping for Environmental Assessments for Proposed Flamingo Potable Water System Improvements and Proposed Flamingo Wastewater System Improvements

Subject: Section 7 Consultation

The National Park Service (NPS) is preparing environmental assessments (EA) to address options for improving the Flamingo potable water system and improving the Flamingo wastewater system, both located within Everglades National Park, Monroe County, Florida. Background information and project descriptions are enclosed. We have also enclosed a table of the Federally listed endangered, threatened, and candidate species which our data suggest have the potential to occur in project areas.

To ensure that the park's planning effort adequately evaluates the potential effect that project implementation would have on threatened and endangered species, we would appreciate your review of the enclosed list.

In keeping with the requirements of Section 7 consultation and NPS policy, as soon as the draft environmental assessments are completed we will send you copies with an official transmittal letter for your review and comment.

We look forward to working cooperatively with you on the planning and implementation of these projects. If you have any questions or desire more information, please contact Skip Snow of our South Florida Natural Resources Center staff at (305) 242-7800 or at skip_snow@nps.gov

Sincerely,

Brien F. Culhane
Chief, Planning and Compliance

Enclosures

Table 6: Federally Listed Endangered, Threatened, and Candidate Species for Everglades National Park, Florida

Common Name	Scientific Name	Status	Potential to occur in project area
REPTILES			
American crocodile	*Crococylus acutus*	Endangered	Yes
Atlantic hawksbill turtle	*Eretmochelys imbricata*	Endangered	No
Green turtle	*Chelonia mydas*	Endangered	No
Atlantic Ridley turtle	*Lepidochelys kempi*	Endangered	No
Atlantic leatherback turtle	*Dermochelys coriacea*	Endangered	No
Eastern indigo snake	*Drymarchon corias couperi*	Threatened	Yes
Loggerhead turtle	*Caretta caretta*	Threatened	No
BIRDS			
Wood stork	*Mycteria americana*	Endangered	Yes
Everglades snail kite	*Rostrhamus sociabilis plumbeus*	Endangered	Yes
Red-cockaded woodpecker	*Picoides borealis*	Endangered	No
Cape Sable seaside sparrow	*Ammodramus maritima mirabilis*	Endangered	Yes
Bald eagle	*Haliaetus leucocephalus*	Threatened	Yes
Piping plover	*Charadrius melodus*	Threatened	No
Roseate term	*Sterna dougallii*	Threatened	No
MAMMALS			
Key Largo cotton mouse	*Peromyscus gossypinus allapaticola*	Endangered	No
Key Large woodrat	*Neotoma floridana smalli*	Endangered	No
West Indian manatee	*Trichechus manatus*	Endangered	No
Florida panther	*Felis concolor coryi*	Endangered	Yes
Mangrove fox squirrel	*Sciurus niger*	Candidate	Yes
PLANTS			
Garber's spurge	*Euphorbia garberi*	Threatened	No
INVERTEBRATES			
Stock Island tree snail	*Orthalicus reses*	Threatened	To be determined
Schaus swallowtail butterfly	*Papilio aristodemus ponceanus*	Endangered	No

APPENDIX C

CONTRACT BID SCHEDULE

EVER 191A - CONTRACT BID SCHEDULE

Item No.	ITEM	Amount of Bid
1	Produce report for FDEP permit application and apply for and obtain permit	Lump Sum = $ 23,000
2	Wastewater treatment plant and building design, and submittals (including plans for demolition of existing plant), meeting BAT rules	Lump Sum = $ 167,000
3	Eco Pond testing, surveying and reporting	Lump Sum = $ 25,000
4	Sewer line testing and leak location	Lump Sum = $ 50,000
5	Construction of WWTP building (breakdown of bid item #4) 100,000 GPD WWTP from NPS Class C estimate guide $2,128,000; additional cost for building on piles = 2,000 square feet x $200/sf = $400,000)	Lump Sum = $ 2,528,000
6	Design, submittals and permitting of sewer line replacement, repair, or rehabilitation	Lums Sum = $ 25,000
7	Demolition of existing plant	Lump Sum = $ 50,000
8	Replace or rehabilitate 6-inch diameter sewer line	3,500 linear feet @ $50/lf = $ 175,000
9	Replace or rehabilitate 4-inch diameter sewer line	1,000 linear feet @ $40/lf = $ 40,000
10	Perform spot repairs on 6-inch diameter sewer line	10 each at $1,000/ea = $ 10,000
11	Perform spot repairs on 4-inch diameter sewer line	50 each at $800/ea = $ 40,000
12	Perform spot repairs on 3-inch diameter sewer line	10 each at $600/ea = $ 6,000
13	Operate WWTP after final acceptance	60 days @ $400/day = $ 24,000
	Total Not To Exceed Amount	**$ 3,163,000**

APPENDIX D

PHOTOGRAPHS OF THE PROJECT AREA

Flamingo wastewater treatment plant, lined pond, and access road.

Wastewater treatment plant building (blower room, office and lab).

Flow equalization tank and aeration tank

Wastewater treatment plant, lined pond and backup percolation pond

Wastewater treatment percolation pond “Eco Pond” and surrounding area

APPENDIX E

FLAMINGO WASTEWATER TREATMENT PLANT
PROPOSED SITE PLAN

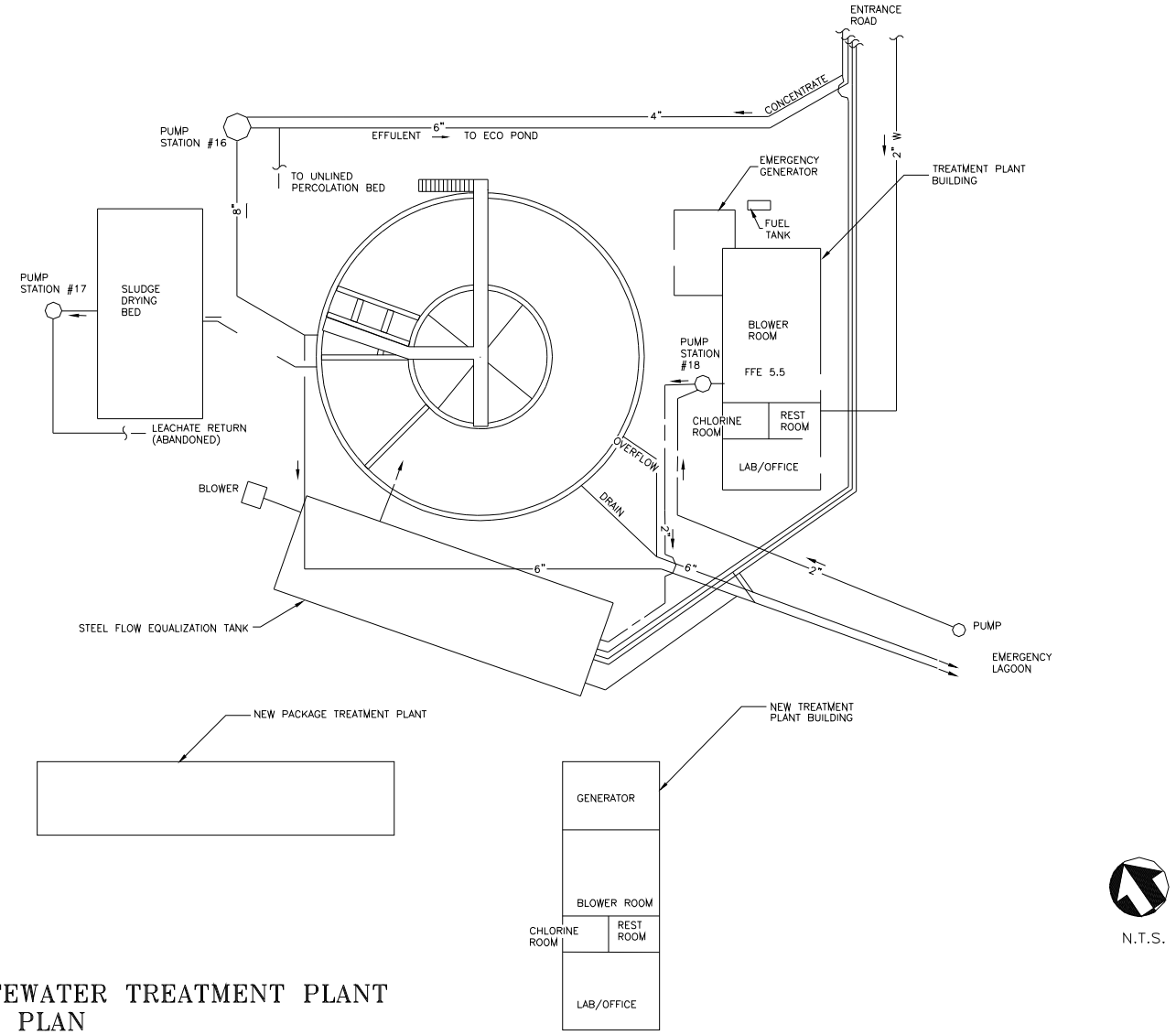

FIGURE 4
FLAMINGO WASTEWATER TREATMENT PLANT
PROPOSED SITE PLAN

APPENDIX F

LIST OF RECIPIENTS THAT RECEIVED

THE SCOPING BROCHURE

Mailing List for Flamingo Water and Wastewater EA Scoping Brochures

***** Denotes a Member of the South Florida Ecosystem Restoration Working Group

Florida Congressional Delegation
U.S. Senate, Hon. Bob Graham
U.S. Senate, Hon. Bill Nelson
U.S. House of Representatives, Hon. Peter Deutsch

Federal Agencies
Advisory Council on Historic Preservation – Mr. Don Klima
U.S. Army Corps of Engineers, Jacksonville District Engineer – Col. James May*
U.S. Army Corps of Engineers, Regulatory Branch, Miami
U.S. Coast Guard – Commander (oan) Seventh Coast Guard District
U.S. Department of Agriculture-Natural Resources Conservation Service – Mr. Ron Smola, *
Mr. Thaddeus Hamilton*
U.S. Department of Commerce-
National Marine Fisheries Service-Southeast Fisheries Science Center
Mr. Brad Brown, Director*
Ms. Neysa Foy Gabriel
NOAA-Florida Keys National Marine Sanctuary – Superintendent Billy D. Causey*
NOAA/Atlantic Oceanographic and Meteorological Laboratory – Mr. Peter Ortner*
U.S. Department of the Interior
Bureau of Indian Affairs – Eastern Office, Mr. Kurt Chandler*
Fish and Wildlife Service – South Florida Field Office Supervisor, Mr. Jay Slack*
Geological Survey- Biological Resources Division- Mr. G. Ronnie Best*
National Park Service **(by e-mail)**
Associate Director, Natural Resources – Mr. Mike Soukup
Water Resources Division – Mr. Dan Kimball
Associate Director, Park Operations – Mr. Dick Ring
Big Cypress National Preserve, Superintendent, Mr. John Donahue
Biscayne National Park, Superintendent Ms. Linda Canzanelli
Everglades National Park employees (300 people)
Southeastern Archeological Center, Director -John Ehrenhard
Southeast Regional Office, Division Planning and Compliance –
Mr. Rich Sussman, Ms. Jami Hammond
South Florida Ecosystem Restoration Task Force – Exec. Director Terrence "Rock" Salt
U.S. Department of Justice – U.S. Attorney's Office, Ms. Barbara Junge*
U.S. Department of Transportation – Federal Highways Administration, Mr. George Hadley*
U.S. Environmental Protection Agency
Groundwater Technology & Management Section – Atlanta GA
South Florida Field Office, Director Richard Harvey*
Federal Emergency Management Agency – Natural Hazards Branch Chief- Atlanta

American Indian tribes
Miccosukee Tribe of Indians of Florida
Chairman Billy Cypress
Water Resources Manager, Mr. Truman E. Duncan*
Mr. Terry Rice*
Seminole Tribe of Florida
Acting Chairman Mitchell Cypress

Water Resources Director, Mr. Craig Tepper*

State of Florida

Office of the Governor, Senior Government Analyst – Mr. Rick Smith*
Florida Department of Agriculture & Consumer Services – Director, Mr. Chuck Aller*
Florida Department of Community Affairs
Community Program Administrator – Mr. Ken Metcalf*
Florida Department of Environmental Protection
District Manager, Fort Myers Office – Mr. Richard W. Cantrell
Director, Ecosystem Planning and Coordination, Mr. Ernest Barnette* - Tallahassee
Florida Department of Transportation
District Six Environmental Administrator, Ms. Marjorie Bixby*
Florida Fish and Wildlife Conservation Commission,
Mr. Allan Egbert – Tallahassee
Office of Environmental Services, Mr. Joseph T. Walsh*
Florida Department of State-Division of Historical Resources
State Historic Preservation Officer- Ms. Janet Snyder Matthews
Florida Senate, District 40 – Hon. Daryl L. Jones
Florida House of Representatives, District –112- Hon. Mario Diaz Balart
Florida House of Representatives, District 120 – Hon. Ken Sorenson
South Florida Water Management District-
Executive Director - Mr. Henry Dean*
Senior Policy Advisor - Ms. Kathy Copeland*
Lead Planner, Water Resources Advisory Commission - Mr. Julio Fanjul

Regional

South Florida Regional Planning Council, Executive Director

County Government
Broward County Department of Natural Resources, Director Steve Sommerville*
Broward County Department of Environmental Protection, Ms. Patti Webster
Miami-Dade County Commission, District 8 Ms.Katy Sorenson
Miami-Dade County Commission, District 9, Mr. Dennis Moss
Miami-Dade County Department of Environmental Resources Management, Director, Mr. John Renfrow
Miami-Dade County Water and Sewer Department, Mr. Roman Wenglowsky
Monroe County Commission, District 5, Mr. Murray Nelson
Monroe County Commission, District 4, Ms. Nora Williams
Monroe County Commission, District 3, Mr. Charles McCoy
Monroe County Commission, District 2, Mr. George Nugent
Monroe County Commission, District 1, Ms. Dixie Spehar
Monroe County Public Works Division – Director, Mr. Dent Pierce
Monroe County Environmental Resources Department – Director, Ms. Marlene Conaway
Monroe County Marine Resources Department – Director, Mr. George Garrett
Palm Beach County Water Utilities Department – Mr. Fred Rapach*

Local Government
City of Homestead, Mayor Roscoe Warren
City of Florida City, Mayor Otis Wallace

Environmental Organizations
Audubon Society of the Everglades- Ms. Rosa Durando
Audubon Society of Florida, CEO Stuart Strahl
Biscayne Bay Foundation, Mr. Edwin Moure
Broward County Sierra Club, Mr. Rod Tirrell
The Conservancy of Southwest Florida – Ms. Kathy Prosser
Citizens for a Better South Florida – Ms. Audrey Ordenes
Clean Water Action – Ms. Kathy Aterno
Earthwise Productions – Audrey and Frank Peterman
Earthjustice Legal Defense Fund – Mr. David Guest
Environmental Defense Fund - Mr. Tim Searchinger,
Everglades Coalition Co-Chair – Ms. Shannon Estenoz
Everglades Coordinating Council – Ms. Barbara Jean Powell
Florida Audubon Society – Mr. Charles Lee
Florida Defenders of the Environment – Ms. Susan Uhl Wilson
Florida Wildlife Federation – Mr. Manley Fuller
Friends of the Everglades – Executive Director
Izaak Walton League, Mr. Michael Chenoweth, Ms. Juanita Green
Ocean Conservancy – Florida Keys Office, Mr. David Holtz , Ms. Nancy Klingener
Sierra Club Fla. – Mr. Craig Diamond
Sierra Club- St. Petersburg – Frank Jackalone
Sierra Club Miami Group, Mr. Alan Farago, Ms. Barbara Lange
National Parks Conservation Association – Ms. Mary Munson
Natural Resources Defense Council – Ms. Sarah Chasis
National Wildlife Federation- Mr. Kris Thoemkke
Redlands Conservancy, Mr. Karsten Rist
Tropical Audubon Society – Executive Director, Mr. Don Chinquina
The Wilderness Society – Mr. Jim Waltman
Word Wildlife Fund Florida Keys Office, Ms. Debbie Harrison
1000 Friends of Florida – Mr. Terrell Arline

Companies
Flamingo Lodge Marina and Outpost Resort, General Manager, Mr. Peter Hulse
Flamingo Lodge Marina and Outpost Resort, employees (37 people)
AMFAC Parks and Resorts, VP Mr. Steve Tedder, and President, Andy Todd
Outward Bound, Ms. Sarah Zeller

Other
South Florida Ecosystem Restoration Task Force, List Server of Interested Parties (**250 people by e-mail**)
Southeast Environmental Research Center, FIU, Mr. Ron Jones, Director*
University of Miami, RSMAS, Dr. Daniel Suman
Homestead/Florida City, Chamber of Commerce, Ms. Mary Finlan
Marathon Chamber of Commerce, Executive Director Ray Kitchener
Tropical Everglades Visitors Association, Executive Director Barry Kenney
Lee County Smart Growth, Mr. Wayne E. Daltry*
Mr. Dennis Sytsma
Mr. Steve Sapp, Sapp Farms, Homestead

APPENDIX G

ECO POND TRANSECT STUDY

Technical Memorandum
Eco Pond Water Quality Monitoring/ Transect Study. Flamingo, Florida

1.0 Project Background

The National Park Service (NPS) operates a wastewater percolation pond, known as Eco Pond, at Flamingo, Florida in the Everglades National Park (**Figure 1**). The NPS is preparing to upgrade the wastewater treatment process facilities at Flamingo, which will require a new construction permit from FDEP. Ground water modeling (CDM, 2002) indicates that the predominant flow is south towards Florida Bay and a small (ca. 2%) of the groundwater flow is north toward Whitewater Bay. In order to determine the existing nutrient gradients to the north, the NPS contracted with CDM Engineers & Constructors (CDM) to conduct a water quality survey of the surface and groundwater north of Eco Pond.

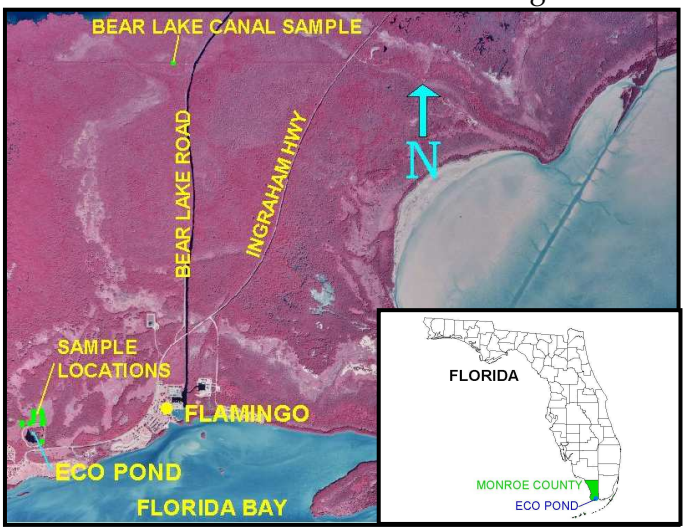

Figure 1
Eco Pond

The scope of services requires that CDM install and monitor three transects of five surficial wells each oriented north from Eco Pond. Wells were to be installed by hand to a depth of 4 feet below land surface (bls). Standing water, if present, adjacent to the well location was to be sampled, as well as surficial groundwater obtained from the wells. Three additional samples were to be collected from Eco Pond and from depressional areas at the northerly extreme of the transects. Each unfiltered sample was to be analyzed for total phosphorus, ortho-phosphate phosphorus, ammonia-nitrogen, nitrite+nitrate-nitrogen and total kjeldhal nitrogen. Field parameters included depth to water bls, temperature, pH and conductivity.

The scope also requires that a letter report be submitted to the NPS following sampling. Graphic representations of concentrations as a function of distance from a background well were to be included in the report. Discussion with NPS staff prior to sampling indicated that in addition to the 15 wells specified in the scope, CDM was to establish and sample the background well at a location north of Eco Pond adjacent to Bear Lake Road.

1.1 Regulatory Background

By virtue of being within the boundaries of a national park, the waters surrounding Eco Pond are designated Outstanding Florida Waters (OFW). In addition, these waters are also classified by the Florida Department of Environmental Protection (FDEP) as Class III freshwater or Class III marine (chloride concentration greater than 1,500 m/l). The implications of each is further discussed in the following paragraphs with respect to increased nutrient loadings associated with the wastewater treatment plant at Flamingo.

The OFW designation is designed to prohibit water quality degradation beyond the ambient conditions that existed when the OFW designation for the specific waterbody was adopted by the Environmental Regulatory Commission. In the case of the OFW designation for the Everglades National Park, the base year is 1979. Therefore, future activities cannot degrade the water quality that existed in 1979. The OFW designation does not explicitly include numeric water quality criteria.

Although there is an exemption for projects that are in the public interest and for which no other alternative exists, the OFW designation effectively precludes new discharge of pollutants directly to the OFW by virtue of the fact that a new discharge cannot degrade the ambient water quality. On the other hand, indirect discharges (e.g. discharges which go first to tributaries that are not OFW, but which ultimately flow into an OFW) are more easily permitted if it can be demonstrated that the new discharge will not significantly degrade the OFW.

In contrast to the OFW designation, the FDEP waterbody classifications do allow for degradation of water quality, providing the water body is not degraded beyond its intended use.

The FDEP waterbody classifications include:

CLASS I	Potable Water Supplies
CLASS II	Shellfish Propagation or Harvesting
CLASS III	Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife
CLASS IV	Agricultural Water Supplies
CLASS V	Navigation, Utility and Industrial Use

As an example, a discharge that reduces dissolved oxygen is permittable, provided the minimum DO criterion is not violated because of the discharge. Chapter 62-303 (Florida Administrative Code) establishes minimum water quality criteria for many parameters, both in numeric and in narrative form. An example of a numeric standard is the copper concentration in a water body. The maximum copper concentration in Class III marine waters is 2.9 ug/l.

Some of the water quality criteria are narrative. The nutrient criteria generally fall into this category. The regulations basically state that nutrients may not be introduced in quantities that will cause an imbalance of the flora or fauna. While there is a "phosphorus" standard, it is for elemental phosphorus (<0.1 ug/l) and is not the same form as phosphorus that is bound organically or as an ortho-phosphate complex. Similarly, there is nitrate standard (10 mg/l) for Class I waters only because of the health affects of consuming water that contains in excess of 10 mg/l nitrate. There is also Class I and Class III (freshwater) aquatic health standard for unionized ammonia (NH_3) (0.02 mg/l) because unionized ammonia is toxic to fish and other fauna.

2.0 Field Sampling

Field sampling was conducted on July 20-21, 2002. Three transects were established northward from Eco Pond to the tree line. Transect stations were marked with wooden survey stakes marked with the station ID. The eastern transect (Stations E1 – E5) was terminated at a depressional area of deeper water characterized with a significant amount of decaying hardwood. A transect consisting of three stations (W1-W3) was established northward from the most westerly edge of Eco Pond and a central (C1-C5) transect was established northward from the mid-point of Eco Pond. (Transect staions markers were left in place at the termination of the sampling effort). Three stations (EC1 – EC3) were established within the waters of Eco Pond, one of which (EC-1) was located at the overflow weir on the north side of the pond. There was no discharge at the time of sampling. **Figure 2** illustrates the location of stations north of, and in Eco Pond. Standing water ranging in depth from 3 – 12 inches was encountered along each transect as shown in **Figures 3** and **4**. An additional station was established in a canal north of Bear Lake road segment north of Eco Pond, but later inspection of aerial photographs and conductivity measurements suggest that this site is connected to Bear Lake. Given the connection to Bear Lake, this station is not considered a valid background station. It was originally intended that a shallow groundwater well on the south side of Bear Lake Road would

Figure 2
Location of Stations

Figure 3
Sample Location Looking North from Eco-Pond

serve as background comparison of the groundwater results from north of Eco Pond. However, since the wells north of Eco Pond were non-productive, it was decided to collect a surface water sample in the same general vicinity as the intended background well for comparison with the standing water north of Eco Pond. It should be noted that standing water was not present on the south side of Bear Lake Road at the time the sample was collected.

Figure 4
Sample Location

Three wells were installed diagonally north of Eco Pond and all were completed in stiff clay that did not produce water. Wells were installed with successive use of a post-hole digger, and a hand auger to an initial depth of approximately 4 feet bls. A hammer was used to drive the wells to a completion depth of approximately 8-9 feet bls. Two of the wells would not provide water when pumped and the third provided a small volume and then stopped producing water. The remaining clay/water slurry was removed with a hand bailer. **Figure 5** illustrates the clay sediments recovered from the auger and **Figure 6** shows the clay slurry that was recovered prior to pumping. The wells, when pumped dry, did not recover.

Figure 5
Clay Deposits from Hand Auger

Figure 6
Clay Slurry
from Well E-1

In lieu of the groundwater samples, unfiltered[2] surface water samples were collected at each transect station by pressing the vegetation down to create a small depression. Sample bottles (pre-preserved as appropriate) were filled by hand directly from these depressions. Entrainment of floating vegetation and some periphyton in the sample bottles was unavoidable at the shallower sites and was most prevalent at the west transect that was sampled first. . [Subsequent to the sampling it was learned that due to such sampling difficulties, the NPS has a policy that requires surface waters to be deeper than 10 cm before collection] During the sampling at the remaining stations, floatables were 'brushed' aside by a gloved-hand while the bottles were filled and relatively less material was entrained. Temperature, pH and conductivity were measured

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[2] The scope of services and the FDEP groundwater sampling SOP (FS2225) promotes unfiltered samples. However, the FDEP SOP for surface water evaluation of ortho-phosphate specifies field filtration. Since the scope of services was for sampling primarily groundwater, field filtration apparatus was not carried into the field.

in the field and recorded. Samples were immediately iced and remained on ice until delivery to the laboratory at 9:00 am July 22. Field sampling occurred between 08:22 – 11:14 am July 21, 2002 an included two field blanks and one duplicate sample.

3.0 Results

The tabular results are provided in **Table 1** and graphically portrayed in **Figures 7-13**. The water in Eco Pond is of lower conductivity and contains significantly higher orthophosphate phosphorus than the waters north of the pond. Ammonia is approximately the same in both the pond and in the waters to the north. All of the unionized ammonia concentrations were below detection limit (0.01 mg/l) and no exceedances of the unionized ammonia standard (0.02 mg/l) were observed. Nitrite plus nitrate concentrations were below detection limit (0.05 mg/l) except at Eco Pond station EC-3, which had a concentration of 0.15 mg/l.

The initial difficulties in sampling the surface water along the western transect (Stations W1, W2 and W3) appear to have contributed to higher TKN, TN, ammonia and TP due to entrainment of vegetation. It should be noted that these four parameters require preservation with sulfuric acid and are transported to the laboratory in the same bottle. Therefore, some acid digestion of the floatables probably occurred during transit.

Figure 7
pH

Figure 8
Temperature (ºC)

Figure 9
Conductivity

Figure 10
Ortho Phosphate-P
Results of Surface Samples

Figure 11
Nitrate + nitrite-n
Results from surface samples

Figure 12
Total Phosphorus
Results from Surface Water

Figure 13
Total Nitrogen
Results from Surface Waters

Considering all of the results, it appears that the surface waters north of Eco Pond are different from the water in Eco Pond. The primary evidence for this is the difference in conductivity and orthophosphate phosphorus. The conductivity and orthophosphate phosphorus at all stations north of the pond is relatively constant as would be expected from a contiguous body of water. The higher concentrations of other parameters in the western transect is believed to be an artifact of the sampling difficulties.

4.0 Groundwater Model Update

The groundwater model developed for Eco Pond site was updated to incorporate the findings of the field visit on July 20-21. During this visit, soil samples collected in the north periphery of Eco Pond revealed the presence of a tight, low permeability clay layer through a soil depth ranging between 5-10 ft.

The permeability of the top 5-ft layer in the groundwater model was assigned a representative value of permeability of clay of 10E-8 m/s. With this update, a model simulation was performed to obtain the percentage of seepage from Eco Pond that travels northward and upward. This percentage was found to be less than one percent. At this rate, it would suggest that there is no impact to the waters located north of Eco Pond caused by the water in Eco Pond.

Table 1
Eco Pond Transects

Station ID	Sample Date	Sample Time (EDT)	pH	Cond (ummho/cm)	Temp (°C)	Total P (mg/l)	PO_4-P (mg/l)	NO_2+NO_3-N (mg/l)	TKN (mg/l)	NH_3-N (mg/l)	NH_3 - Unionized (mg/l)	TN (mg/l)
W-1	7/21/2002	8:22	7.40	2,600	28.0	0.36	< 0.05	< 0.050	3.10	0.051	< 0.010	3.10
W-2	7/21/2002	8:28	7.40	2,500	28.0	0.92	< 0.05	< 0.050	11.0	0.226	< 0.010	11.0
W-3	7/21/2002	8:33	7.00	3,250	28.0	0.28	< 0.05	< 0.050	4.60	0.156	< 0.010	4.60
C-1	7/21/2002	8:50	7.30	2,400	28.0	0.19	0.08	< 0.050	1.20	0.117	< 0.010	1.20
C-2	7/21/2002	8:55	7.00	2,850	27.0	<0.10	< 0.05	< 0.050	1.90	0.109	< 0.010	1.90
C-3	7/21/2002	8:58	7.00	2,950	28.0	<0.10	< 0.05	< 0.050	1.90	0.101	< 0.010	1.90
C-4	7/21/2002	9:03	6.90	2,700	28.0	0.12	< 0.05	< 0.050	2.60	0.132	< 0.010	2.60
C-5	7/21/2002	9:07	6.90	2,650	28.0	0.12	< 0.05	< 0.050	1.90	0.132	< 0.010	1.90
E-1	7/21/2002	9:30	6.90	2,700	29.0	0.22	< 0.05	< 0.050	2.00	0.117	< 0.010	2.00
E-2	7/21/2002	9:35	7.00	3,090	30.0	0.11	< 0.05	< 0.050	1.90	0.093	< 0.010	1..9
E-3	7/21/2002	9:40	6.90	2,500	28.0	0.12	< 0.05	< 0.050	2.90	0.101	< 0.010	3.10
E-4	7/21/2002	9:45	6.90	2,400	28.5	<0.10	< 0.05	< 0.050	1.90	0.117	< 0.010	1.90
E-5	7/21/2002	9:50	6.70	2,450	28.5	<0.10	< 0.05	< 0.050	1.60	0.093	< 0.010	1.60
EC-1	7/21/2002	10:05	7.00	1,000	29.0	0.34	0.29	< 0.050	0.74	0.086	< 0.010	0.74
EC-1D	7/21/2002	10:05				0.33	0.30	< 0.050	0.89	0.086	< 0.010	0.89
EC-2	7/21/2002	10:20	7.00	1,070	31.0	0.51	0.35	< 0.050	0.96	0.058	< 0.010	0.96
EC-3	7/21/2002	10:44	7.10	1,150	32.0	0.74	0.42	0.150	0.95	0.117	< 0.010	0.95
FB-1	7/21/2002	9:20				<0.10	< 0.05	< 0.050	<0.20	< 0.030	< 0.010	<0.20
FB-2	7/21/2002	9:20				<0.10	< 0.05	< 0.050	<0.20	< 0.030	< 0.010	<0.20
Back	7/21/2002	11:14	7.10	12,000	28	0.10	< 0.05	< 0.050	1.20	< 0.030	< 0.010	1.20

APPENDIX H

ECO POND TRANSECT STUDY ADDENDUM

Addendum to CDM Technical Memorandum

Eco Pond Water Quality Monitoring/Transect Study

Flamingo, Florida

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August 8, 2002

Background

Upon reviewing the results of CDM's Technical Memorandum, ENP staff decided that a second sampling event would provide additional useful information. Therefore, a second sampling was conducted on August 2, 2002, by staff of the Everglades Program Team (EPT) to augment CDM's study.

In particular, EPT staff were concerned that surface water levels were too low to collect water by dipping sample bottles, especially when vegetation had to be pushed aside by hand. TP analyses require no filtration, and involve field acidification and laboratory digestion steps. Particulate matter not normally present in the surface water (bits of vegetation, periphyton, or detritus), but entrained by the sampling procedure, can result in artificially high and unrepresentative TP values. In fact, CDM recognized this potential problem while they were sampling the west transect, and modified their technique somewhat when sampling the center and east transects. This change in technique may be reflected in their reported TP values, in which TP values for the west transect were much higher than the other two transects. Everglades surface water samples typically are not collected when depths are less than 10 cm, and this precaution is noted in field QA/QC protocols employed by the Dept. of Environmental Protection and the South Florida Water Management District. If samples are collected when depths are less than 10 cm, great care must be taken to avoid disturbing adjacent vegetation or the underlying floc layer, and the interpretation of the resulting water quality data must consider the shallow depths.

Another concern was that because CDM anticipated collecting only well water samples, they had sample bottles that were pre-preserved, meaning that preservation solutions were dispensed into sample bottles before water sample collection. Pre-preservation made it more difficult to collect surface water samples by hand dipping the bottles.

Finally, CDM employed an analytical laboratory that had relatively high detection limits, particularly for TP (0.05 mg/L). Because there is concern that the Everglades ecosystem, even at the estuarine interface, is sensitive to phosphorus, it is important to employ analytical techniques with the most sensitive (low) detection limits. The South Florida Water Management District agreed to conduct the TP analyses, and their laboratory procedure has a minimum detection limit of 0.004 mg/L TP.

Methods

Water samples

Field sampling was conducted on Friday, August 2, 2002. Surface water samples were collected, where possible, from stations along the three transects (west, center, and east) established by CDM (see CDM Technical Memorandum for details). Sample labels (e.g., "C-1") are the same as in the CDM Memorandum. In addition, a water sample was collected from a relatively large body of standing water located between C-3 and C-4, and was labeled "C-open." No sample was collected from CDM's reference site, which was located in a canal leading to Bear Lake. Two new reference sites were sampled; both were located in coastal prairie habitat similar to that immediately north of Eco Pond, but far enough from Eco Pond to be uninfluenced from any potential impacts. One, labeled "far west reference," was located in coastal prairie approximately 100 m west of the west transect, close to the tree line. The second, labeled "campground reference," was located in coastal prairie just north of the westernmost paved loop in the Flamingo campground, almost to the head of the coastal prairie trail. An attempt was made to sample a reference location to the east of the east transect, but no standing water was present in that direction.

Samples were collected using a 30-cm length of tygon tubing (3 mm inside diameter) attached to a 100 mL plastic syringe. Sample sites were located as close to each of the transect stakes as possible, but in areas not disturbed by foot traffic. Due to the low water levels, the actual sample may have been collected as far as 5 m from the actual stake. The tip of the tubing was submerged carefully below the water surface, and water was drawn into the syringe. The syringe was rinsed with sample water before the samples were dispensed into plastic sample bottles. The sample bottles were rinsed three times with sample water before the final sample was collected. Samples were preserved with sulfuric acid to pH 2.0, and placed on ice for transport to the laboratory. Field blanks and equipment blanks were collected, as well as 1 duplicate field sample for every 10 field samples. Samples were analyzed for TP on August 5, 2002, by the South Florida Water Management District chemistry laboratory in West Palm Beach.

Temperature, specific conductivity (temperature-compensated conductivity), and salinity were measured in the field where possible using a YSI Model 85 instrument and probe. To obtain accurate measurements, the probe had to be fully submerged and not touching the water surface or sediment. Because probe submersion required a water depth of approximately 5 cm, these measurements sometimes were made at a location different from where the water sample was withdrawn, and for some locations, no measurements were possible. The time of sample collection was recorded, as well as estimates of water depth.

Well sampling

CDM had installed 3 ground water wells – one in each transect – on July 21, 2002. They were unable to produce water from the wells for samples. We examined all three wells on August 2, 2002 (13 days later), and found all to contain water up to within ~20 cm of the surface water level. The well located at C-3 was pumped dry, using a battery-powered peristaltic pump and tygon tubing lowered down into the well. After 70 minutes, another attempt was made to produce water from the well, but all that was pumped was a small amount of sediment slurry. This result confirms CDM's finding that ground water transmissivity is likely to be very low.

Results and Discussion

Hydrology

Water levels apparently had dropped since the July sampling. CDM reported depths of 3 – 12 inches, whereas the deepest depth at the August 2 sampling locations was ~10 cm (~ 4 inches) (Table 1). We were unable to collect water samples from W-1 and W-2 because of very low water depths (< 1 cm).

Water depths were greatest at stations along the center and east transect. As we walked westward from the west transect to collect 2 reference samples, we noted that water depths were much lower than immediately north of Eco Pond, raising the possibility that Eco Pond is the source of some of the standing water in the coastal prairie to the north, at least during the wet season. We also walked eastward from the east transect, and were unable to locate a reference site because of the lack of standing water. Visual observations of the coastal prairie to the north of Eco Pond during the dry season, however (November 2001), revealed no surface water at all.

The possibility that Eco Pond is the source of standing water was reinforced by our observation of surface flow of water between stations C-1 and C-2 along a narrow flow way free of any vegetation. The flow was to the north, away from Eco Pond's levee. We estimated the velocity to be about 0.1 feet per second. The visual presence of flow was apparent only at this location, despite our search for it in other locations along all 3 transects. The presence of flow does not prove that water is moving from Eco Pond northward into the coastal prairie, but it does raise the possibility.

Water quality

Possible physical/chemical (temperature, specific conductivity, salinity) trends are difficult to evaluate because of lack of data from the drier sites (Table 1). These data are available for only 10 of the 18 sample locations. Because the west transect TP values from the July sampling may have been artificially high, and because no samples were collected from W-1 and W-2 during the August sampling, this transect was eliminated from further consideration in this report.

However, a nearly complete record (except for stations W-1 and W-2) exists for TP, allowing for an analysis of trends and comparison to the July sampling (Figure 1). Overall, the August sampling revealed lower TP concentrations than the July sampling. It is likely that this result is due to the difference in sampling methods and the lower detection limits of the laboratory used in the August sampling. Other explanations are possible, such as a decline in actual TP concentrations in the coastal prairie. However, lower water levels typically are accompanied by an increase in TP levels due to the concentration effects of evaporation.

Based on the TP values observed at the 2 reference sites, and at other locations along the transects sampled in August, background concentrations of TP were in the 0.050 – 0.070 mg/L range (Figure 1). This range of concentrations, while higher than observed in pristine freshwater marshes of the Everglades, may be typical for surface waters in estuarine or marine transitional marshes. Estuarine waters such as Florida Bay have higher background concentrations of TP than freshwaters, and other studies have shown that Eco Pond and surrounding ground waters are influenced by Florida Bay waters.

An obvious gradient of TP concentrations is apparent at the E transect from both the July and August samplings (Figure 1). This gradient is from higher TP concentrations at E-1, to lower concentrations northward (away from the levee) to E-5. Concentrations of TP range from slightly above 0.2 mg/L near the levee to near background levels (~ 0.05 mg/L) at the farthest site northward from the levee. Concentrations of TP in Eco Pond just inside of the north levee were approximately 0.25 mg/L. The presence of this gradient in both sampling events strongly suggests that there is movement of water from inside of Eco Pond to surface waters north of Eco Pond's levee.

It is possible that the source of this gradient is from Eco Pond water that has percolated down into ground water. That ground water would then have to move laterally to the north, reconnecting with surface water outside of the pond. While this source is possible, it is not likely based on the imperviousness of the marine clay layer that CDM encountered when drilling their wells. The inability of one of these wells (at C-3) to produce ground water over a 70-minute period reinforces the notion of very low transmissivity.

A more likely possibility is the lateral movement of Eco Pond surface water northward through the levee to connect with surface water on the outside of the levee. An observation that supports this possibility is the presence of woody vegetation (mostly red mangrove and buttonwood) along the levee sides. One quite large tree, possibly in the 20-40 year age class, is located on the outside of the levee adjacent to the overflow weir. Woody roots eventually die and decay, leaving tunnels in the levee through which water can move. To minimize the possibility of such lateral movement, a curtain wall was installed from the top-center of the levee down to a depth of 3-4 feet, at which point the installers encountered the marine clay layer. Although the curtain wall is present, it still is possible that lateral flow occurs underneath it.

Despite the possibility that Eco Pond water is/has been influencing TP concentrations in surface water outside of the levee, there are no obvious, visual impacts to coastal prairie vegetation. Based on our visual observations of the vegetation north of the pond, and at the reference sites that we sampled, there were no differences in vegetation. It should be noted, however, that nutrient-induced changes in Everglades freshwater marshes begin at levels that are not apparent to casual observation, and more detailed vegetation and other ecological studies would be required to confirm our visual observations.

Conclusions

Two sets of surface water samples collected at different times along a surface water transect strongly suggest that there is movement of water from inside of Eco Pond to outside of the levee, particularly at the eastern end of the northern levee. The possibility of this movement is supported by the pattern of coastal prairie surface water depths, visual indications of water flow away from the levee, and gradients in TP concentration. It is most likely that this water is moving laterally across the levee, rather than downward into ground water and upwelling outside of the levee. The presence of an impervious, marine clay layer in the coastal prairie likely would present a barrier to ground water upwelling. Also, the presence of woody vegetation raises the possibility of piping of Eco Pond water through the levee along channels created by decaying roots. This movement of Eco Pond water into coastal prairie surface waters, at least during the wet season, indicates the possibility of negative impacts to these surface waters, which are Outstanding Florida Waters (OFW) subject to a no-degradation rule. Even though this movement of water is possible, there are no obvious, visual indication of vegetation impacts, despite decades of operation of Eco Pond.

Recommendations

Additional studies are needed to confirm that water movement is taking place from inside Eco Pond to surface waters in the coastal prairies to the north. Tracer studies using organic dyes (e.g., rhodamine WT, fluoroscene) or non-reactive inorganic salts (e.g., bromide, lithium chloride) might provide useful information if they are performed during the wet season. However, some of these materials do absorb to particles, making their use in ground water studies problematic. An additional problem is the high levels of inorganic constituents (such as chloride) in the marine-influenced ground water of the coastal prairie, limiting the usefulness of traditional inorganic tracers. Time-of-travel studies with tracers might help delineate lateral movement of water through the levee from ground water transport.

Analysis of water on both sides of the levee for stable anthropogenic substances commonly found in wastewater (e.g., caffeine) is recommended. This approach has recently gained favor for these types of problems. If one or more of these substances is found on both sides, it would confirm movement of water from inside of the levee to the outside. Absence of these substances on the outside would not prove that water is not moving across the levee, but it would be another piece of evidence.

These additional studies are important to better frame possible solutions. For example, if lateral movement of water is occurring across the levee, raising the possibility of OFW impacts, refurbishment of the levee might prove less expensive than higher levels of wastewater treatment.

1 Table 1: Physical/chemical data from August 2, 2002 sampling. Values for TP from the July sampling are included for comparison.

2

Eco-Pond Transects - second sampling 8/2/02

Station ID	Sample #	Station Coordinates	Sample Date	Sample Time (EDT)	Sample depth (est cm)	Cond (uS)	Temp (Cel)	Salinity (ppt)	Total P (mg/L) July 21	Total P (mg/L) August 2	Comments
EC-1	1	25 08.458 N 80 56.201 W	8/2/2002	13:22	10	962	31.4	0.5	0.34	0.245	
EC-2	2	25 08.450 N 80 56.291 W	8/2/2002	13:17	8	976	33.3	0.5	0.51	0.266	
C-1	8	25 08.476 N 80 56.253 W	8/2/2002	10:30	2				0.19	0.071	Too shallow for probe
C-2	9	25 08.490 N 80 56.253 W	8/2/2002	10:39	2	6,310	31.3	3.4	0.05	0.054	
C-3	10	25 08.503 N 80 56.253 W	8/2/2002	10:48	3	6,500	32.2	3.5	0.05	0.063	
C-4	11	25 08.514 N 80 56.250 W	8/2/2002	11:00	4	5,210	31.1	2.8	0.12	0.082	
C-5	12	25 08.526 N 80 56.253 W	8/2/2002	11:08	3	5,790	29.5	3.1	0.12	0.071	
E-1	18	25 08.470 N 80 56.192 W	8/2/2002	11:28	2	3,975	31.8	2.1	0.22	0.205	
E-2	17	25 08.484 N 80 56.194 W	8/2/2002	11:36	3	6,900	34.1	3.7	0.11	0.089	
E-3	16	25 08.501 N 80 56.198 W	8/2/2002	11:42	1				0.12	0.042	Too shallow for probe
E-4	15	25 08.517 N 80 56.203 W	8/2/2002	11:44	2				0.05	0.059	Too shallow for probe
E-5	13	25 08.536 N 80 56.208 W	8/2/2002	11:52		4,248	34.0	2.2	0.05	0.057	
C-open	20					3,930	36.9	2.0		0.095	
West ref	5	25 08.441 N 80 56.415 W	8/2/2002		1					0.047	Too shallow for probe
Campgrd ref	4	25 08.259 N 80 56.676 W	8/2/2002		2					0.061	Too shallow for probe; across from campground sign B32-40

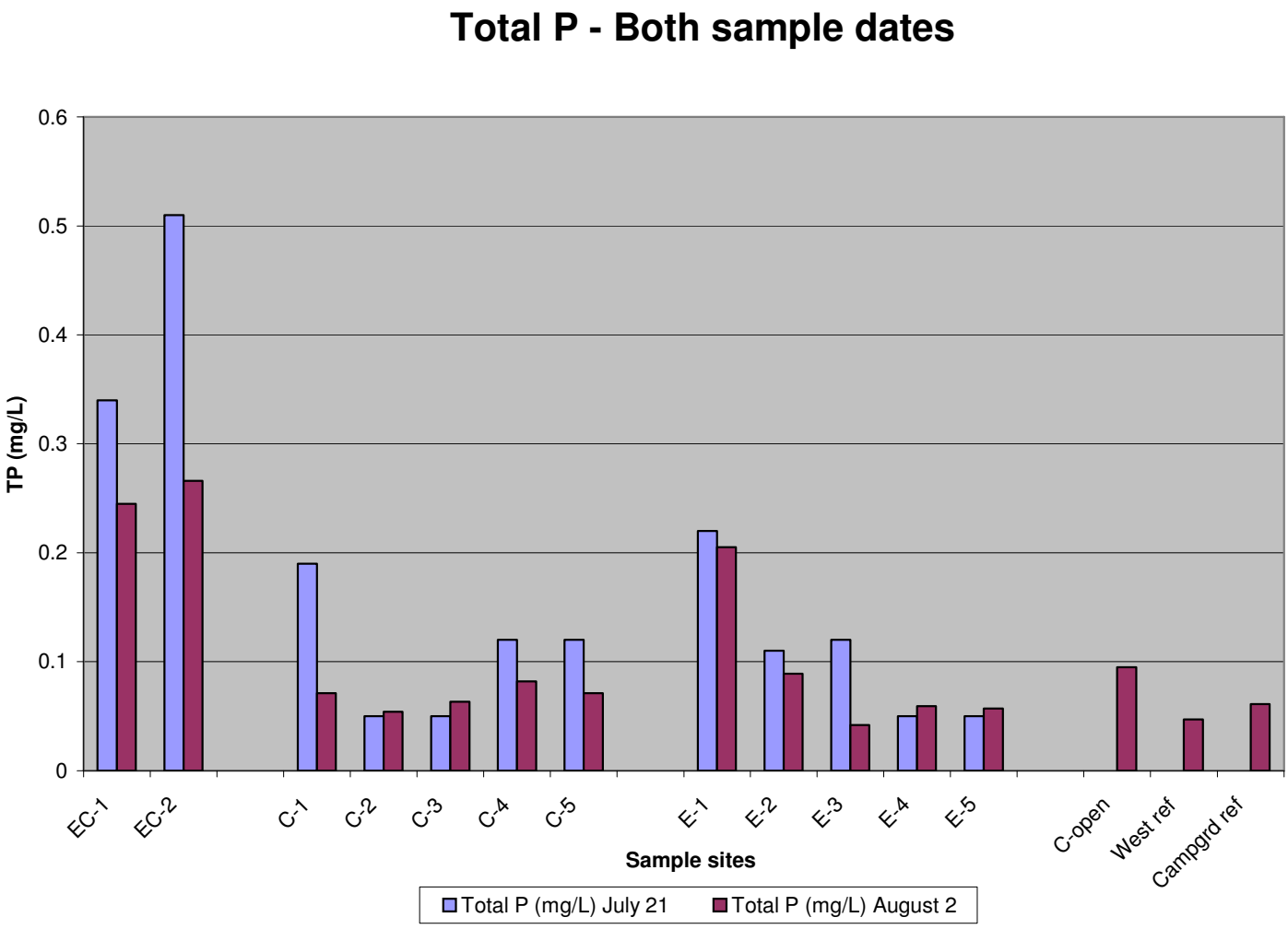

Figure 1: Summary graph of TP trends from both sampling events: in Eco Pond (EC-1 and EC-2); along the center and east transects (C and E designations); open water between C-3 and C-4 (C-open); and two reference sites (West ref and Campgrd ref).

APPENDIX I

VALUE ANALYSIS

Part 1: VALUE ANALYSIS PARTICIPANTS

Part 2: CHOOSING BY ADVANTAGES MATRIX

Part 3: ALTERNATIVE COSTS

PART 1

NATIONAL PARK SERVICE
VALUE ANALYSIS STUDY
EVERGLADES NATIONAL PARK
FLAMINGO WASTEWATER SYSTEM IMPROVEMENTS

SEPTEMBER 21 AND 22, 2000

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PART 2
EVERGLADES NATIONAL PARK – FLAMINGO WWTP

CHOOSING BY ADVANTAGES MATRIX

COMPONENT:									FUNCTION:					
FACTOR	ALTER-NATIVES													
	Alternative 1 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report		Alternative 2 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report plus meet Class III redundancy requirements		Alternative 3 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box		Alternative 4 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box plus meet Class III redundancy requirements		Alternative 5 Construct a new package WWTP and demolish the existing plant		Alternative 6 Construct a new package WWTP and mothball the existing plant		Alternative 7 Do Nothing	
PROTECT CULTURAL AND NATURAL RESOURCES														
FACTOR 1 - Prevent Loss of Resources														
Attributes			• Class III Redun-dancy				• Class III Redun-dancy		• Class III Redun-dancy				• Does not prevent loss	
Advantages		68		82		74		86		95		90		0
FACTOR 2 – Maintain and Improve Condition of Resources														

COMPONENT:														FUNCTION:	
FACTOR	ALTER-NATIVES														
	Alternative 1 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report		Alternative 2 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report plus meet Class III redundancy requirements		Alternative 3 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box		Alternative 4 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box plus meet Class III redundancy requirements		Alternative 5 Construct a new package WWTP and demolish the existing plant		Alternative 6 Construct a new package WWTP and mothball the existing plant		Alternative 7 Do Nothing	
Attributes	• Risk of spill or discharge during construction		• Class III Redun-dancy • Risk of spill or discharge during construction		• Anoxic box (minimizes chance of spill or discharge during construction)		• Class III • Anoxic box (minimizes chance of spill or discharge during construction)		• Class III Redun-dancy • Minimizes chance of spill or discharge during construction • Best long term reliability		• Class III Redun-dancy • Minimizes chance of spill or discharge during construction • Long term reliability similar to Alternative 5		• Does not improve • May cause decrease	
Advantages		70		85		73		90		100		95		0
PROVIDE FOR VISITOR ENJOYMENT														
FACTOR 3 - Provide Visitor Services and Educational and Recreational Opportunities														

COMPONENT:									FUNCTION:							
FACTOR	ALTER-NATIVES															
	Alternative 1 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report		Alternative 2 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report plus meet Class III redundancy requirements		Alternative 3 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box		Alternative 4 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box plus meet Class III redundancy requirements		Alternative 5 Construct a new package WWTP and demolish the existing plant		Alternative 6 Construct a new package WWTP and mothball the existing plant		Alternative 7 Do Nothing	
Attributes			• Class III Redund-ancy				• Class III Redund-ancy		• Class III Redun-dancy • Plant tours • New facility		• Class III • Plant tours • Contrasting technology		• No benefit	
Advantages		55		70		65		73		79		79		0
FACTOR 4 - Protect Public Health, Safety and Welfare														
Attributes	• No process redundancy • Shutdown required for maintenanc e • Potential for spillage during construction		• Has process redundancy • Less downtime • Similar spill potential as Alternative 1		• Less downtime for aeration during construction • No Class III redundancy		• Class III redundancy • Less operation downtime during construction • Less potential for spill than Alternative 1 and 2		• No operation interruption during construction • Overall most reliable • Meets Class III – all new		• No operation interruption during construction • Meets Class III		• Highest potential for failure	
Advantages		65		80		73		84		90		87		1 0

COMPONENT:														FUNCTION:		
FACTOR	ALTER-NATIVES															
	Alternative 1 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report		Alternative 2 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report plus meet Class III redundancy requirements		Alternative 3 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box		Alternative 4 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box plus meet Class III redundancy requirements		Alternative 5 Construct a new package WWTP and demolish the existing plant		Alternative 6 Construct a new package WWTP and mothball the existing plant		Alternative 7 Do Nothing	
IMPROVE EFFICIENCY OF PARK OPERATIONS																
FACTOR 5 - Improve Operational Efficiency and Sustainability																
Attributes	• No Class III redundancy • Improves phosphorus and nitrogen removal capability • Improves monitoring and control • Increased sludge production • More difficult startup following construction		• Class III Redun-dancy • Improves phosphorus and nitrogen removal capability • Improves monitoring and control • Increased sludge production • More difficult startup following construction		• No Class III Redun-dancy • Improves phosphorus and nitrogen removal capability • Improves monitoring and control • Increased sludge production		• Class III Redun-dancy • Improves phosphorus and nitrogen removal capability • Improves monitoring and control • Increased sludge production		• Highest life expectancy • Improves phosphorus and nitrogen removal capability • Improves monitoring and control • Increased sludge production		• Second highest life expectancy • Mix and match I&C • Improves phosphorus and nitrogen removal capability • Improves monitoring and control • Increased sludge production		• No increase in sludge hauling • Shortens sustainabilit y • No efficiency improveme nts	

COMPONENT:															FUNCTION:	
FACTOR	ALTER-NATIVES															
	Alternative 1 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report		Alternative 2 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report plus meet Class III redundancy requirements		Alternative 3 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box		Alternative 4 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box plus meet Class III redundancy requirements		Alternative 5 Construct a new package WWTP and demolish the existing plant		Alternative 6 Construct a new package WWTP and mothball the existing plant		Alternative 7 Do Nothing	
Advantages		50		70		60		75		85		80		0
FACTOR 6 - Protect Employee Health, Safety and Welfare														
Attributes	• Risk due to higher potential for wastewater contact • Increased risk due to chemical handling		• Increased risk with Class III due to more equipment • Increased risk due to chemical handling		• Increased risk due to chemical handling		• Increased risk with Class III due to more equipment • Increased risk due to chemical handling		• Increased risk with Class III due to more equipment • New facility can be designed to minimize risk • Increased risk due to chemical handling		• Increased risk with Class III due to more equipment • Not as good as Alternative 5 since existing facility still used • New facility can be designed to minimize risk • Increased risk due to chemical handling		• Increased risk with Class III due to more equipment • Least protection • Manual samplers • Ladders • Old rails • Old grate • No additional coagulant • No additional methanol	
Advantages		54		75		66		79		92		88		5

COMPONENT:														FUNCTION:		
FACTOR	ALTER-NATIVES															
	Alternative 1 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report		Alternative 2 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report plus meet Class III redundancy requirements		Alternative 3 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box		Alternative 4 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box plus meet Class III redundancy requirements		Alternative 5 Construct a new package WWTP and demolish the existing plant		Alternative 6 Construct a new package WWTP and mothball the existing plant		Alternative 7 Do Nothing		
PROVIDE COST-EFFECTIVE, ENVIRONMENTALLY RESPONSIBLE, AND OTHERWISE BENEFICIAL DEVELOPKENT FOR THE NPS																
FACTOR 7 - Provide Other Advantages to the National Park System																

COMPONENT:															FUNCTION:	
FACTOR	ALTER-NATIVES															
	Alternative 1 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report		Alternative 2 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report plus meet Class III redundancy requirements		Alternative 3 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box		Alternative 4 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box plus meet Class III redundancy requirements		Alternative 5 Construct a new package WWTP and demolish the existing plant		Alternative 6 Construct a new package WWTP and mothball the existing plant		Alternative 7 Do Nothing	
Attributes	• No Class III Redun-dancy		• Class III Redun-dancy		• No Class II Redun-dancy		• Class III Redun-dancy		• Class III Redun-dancy • Most likely to consistently exceed permit require-ments • Better capability to handle seasonal flow fluctuations		• Class III Redun-dancy		• Will not meet permit require-ments	
Advantages		50		80		65		90		100		98		0
TOTAL IMPORTANCES OF ADVANTAGES		412		542		476		577		641		617		15
Initial Cost (Net)	$1,720,000		$1,980,000		$1,840,000		$2,100,000		$2,530,000		$2,380,000		$0	

COMPONENT:																			FUNCTION:	
FACTOR	ALTER-NATIVES																			
	Alternative 1 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report		Alternative 2 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report plus meet Class III redundancy requirements		Alternative 3 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box		Alternative 4 Rehabilitate and upgrade the existing WWTP per the August 2000 Design Analysis Report with a separate anoxic box plus meet Class III redundancy requirements		Alternative 5 Construct a new package WWTP and demolish the existing plant		Alternative 6 Construct a new package WWTP and mothball the existing plant		Alternative 7 Do Nothing			
Re-design Cost																				
Compliance																				
Life Cycle Cost (Net)	$1,460,790		$1,460,790		$1,460,790		$1,460,790		$1,233,611		$1,244,335		$1,460,790							
TOTAL	$3,180,790		$3,440,790		$3,300,790		$3,560,790		$3,762,611		$3,634,335		$1,460,790							
Version 12/11/98																				

PART 3: ALTERNATIVE COSTS

Richard P. Arber Associates, Inc. — **OPINION OF PROBABLE**
Consulting Engineering and Project Management — **CONSTRUCTION COST**
Client: — Project No: CONPS67
National Park Service — Sheet 1 of
Project: — By: WLV Ckd:
Everglades National Park - Flamingo WWTP Improvements — Date: 10/4/00
Item:
Common Items

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
New WWTP Control Building				
Building on Piles	1,000	SF	$300	$300,000
Lab Equipment	1	LS	$15,000	$15,000
Relocate existing blowers, generator, etc.	1	LS	$15,000	$15,000
PD Blowers	3	EA	$15,000	$45,000
Sewage lift Station	1	EA	$15,000	$15,000
Subotal				**$390,000**
Coagulant Feed System				
Liquid Chemical Storage and Feed System	1	LS	$15,000	$15,000
Subtotal				**$15,000**
Collection System				
Repair/Replace 6-inch PVC F.M.	2,500	LF	$30	$75,000
Repair/Replace 4-inch gravity sewer	3,800	LF	$26	$98,800
Subtotal				**$173,800**
Eco Pond				
Dredge Sludge	300	TONS	$500	$150,000
Subtotal				**$150,000**
SUBTOTAL				**$728,800**
Sitework	5%			$36,440
Electrical and Instrumentation	15%			$109,320
Piping and Valving	10%			$72,880
Special Conditions	5%			$36,440
Remoteness Factor	20%			$145,760
SUBTOTAL				**$1,129,640**
Overhead and Profit	20%			$225,928
Contingency	10%			$112,964
TOTAL				***$1,470,000***

Richard P. Arber Associates, Inc. **OPINION OF PROBABLE**
Consulting Engineering and Project Management **CONSTRUCTION COST**
Client: Project No: CONPS67
National Park Service Sheet 1 of
Project: By: WLV Ckd:
Everglades National Park - Flamingo WWTP Improvements Date: 10/4/00
Item:
Alternative 1: Rehab and Upgrade Existing WWTP per Design Analysis Report

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
Rehabilitation				
Demolition	1	LS	$25,000	$25,000
Replace Bridging	300	SF	$25	$7,500
Replace Stairs	1	LS	$3,500	$3,500
Concrete Repair	1	LS	$25,000	$25,000
Replace 3 hp submersible pump	5	EA	$3,800	$19,000
Subotal				**$80,000**
Anoxic Zone				
Preparation	1	LS	$10,000	$10,000
Mixers	2	EA	$2,500	$5,000
Concrete Walls	11	CY	$500	$5,500
Subtotal				**$20,500**
Sludge Holding Tank				
Concrete Walls	11	CY	$500	$5,500
Telescoping Valve 6"	2	EA	$2,400	$4,800
Diaphragm Pump 6"	2	EA	$6,000	$12,000
Fine Bubble Diffuser	50	LF	$20	$1,000
Subtotal				**$23,300**
SUBTOTAL				**$123,800**
Sitework	5%			$6,190
Electrical and Instrumentation	15%			$18,570
Piping and Valving	10%			$12,380
Special Conditions	5%			$6,190
Remoteness Factor	20%			$24,760
SUBTOTAL				**$191,890**
Overhead and Profit	20%			$38,378
Contingency	10%			$19,189
TOTAL				***$250,000***

Richard P. Arber Associates, Inc.
Consulting Engineering and Project Management

OPINION OF PROBABLE CONSTRUCTION COST

National Park Service
Everglades National Park - Flamingo WWTP Improvements
Item:
Alternative 2: Alternative 1 + Class 3 Redundancy (add new clarifier)

Project No: CONPS67
Sheet 1 of
Date: 10/4/00

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
Rehabilitation				
Demolition	1	LS	$25,000	$25,000
Replace Bridging	300	SF	$25	$7,500
Replace Stairs	1	LS	$3,500	$3,500
Concrete Repair	1	LS	$25,000	$25,000
Replace 3 hp submersible pump	5	EA	$3,800	$19,000
Subotal				**$80,000**
Anoxic Zone				
Preparation	1	LS	$10,000	$10,000
Mixers	2	EA	$2,500	$5,000
Concrete Walls	11	CY	$500	$5,500
Subtotal				**$20,500**
Sludge Holding Tank				
Concrete Walls	11	CY	$500	$5,500
Telescoping Valve 6"	2	EA	$2,400	$4,800
Diaphragm Pump 6"	2	EA	$6,000	$12,000
Fine Bubble Diffuser	50	LF	$20	$1,000
Subtotal				**$23,300**
Secondary Clarifier				
Concrete Slab	50	CY	$400	$20,000
Concrete Walls	25	CY	$500	$12,500
Clarifier Mechanism	1	LS	$50,000	$50,000
Collection troughs, weirs, bridge, etc.	1	LS	$15,000	$15,000
RAS/WAS Pump Station	1	LS	$14,000	$14,000
Scum Pump Station	1	LS	$14,000	$14,000
Subtotal				**$125,500**
SUBTOTAL				**$249,300**
Sitework	5%			$12,465
Electrical and Instrumentation	15%			$37,395
Piping and Valving	10%			$24,930
Special Conditions	5%			$12,465
Remoteness Factor	20%			$49,860
SUBTOTAL				**$386,415**
Overhead and Profit	20%			$77,283
Contingency	10%			$38,642
TOTAL				***$510,000***

Richard P. Arber Associates, Inc.
Consulting Engineering and Project Management

OPINION OF PROBABLE CONSTRUCTION COST

National Park Service
Everglades National Park - Flamingo WWTP Improvements
Item:
Alternative 3
Alternative 1 w/ separate anoxic box

Project No: CONPS67
Sheet 1 of
By: WLV Ckd:
Date: 10/4/00

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
Rehabilitation				
Demolition	1	LS	$25,000	$25,000
Replace Bridging	300	SF	$25	$7,500
Replace Stairs	1	LS	$3,500	$3,500
Concrete Repair	1	LS	$25,000	$25,000
Replace 3 hp submersible pump	5	EA	$3,800	$19,000
Subotal				**$80,000**
Separate Anoxic Box				
Mixers	2	EA	$2,500	$5,000
50,000-gallon steel tank & appurtenances	1	EA	$60,000	$60,000
Concrete Slab	35	CY	$400	$14,000
Subtotal				**$79,000**
Sludge Holding Tank				
Concrete Walls	11	CY	$500	$5,500
Telescoping Valve 6"	2	EA	$2,400	$4,800
Diaphragm Pump 6"	2	EA	$6,000	$12,000
Fine Bubble Diffuser	50	LF	$20	$1,000
Subtotal				**$23,300**
SUBTOTAL				**$182,300**
Sitework	5%			$9,115
Electrical and Instrumentation	15%			$27,345
Piping and Valving	10%			$18,230
Special Conditions	5%			$9,115
Remoteness Factor	20%			$36,460
SUBTOTAL				**$282,565**
Overhead and Profit	20%			$56,513
Contingency	10%			$28,257
TOTAL				***$370,000***

Richard P. Arber Associates, Inc.
Consulting Engineering and Project Management

OPINION OF PROBABLE CONSTRUCTION COST

National Park Service
Everglades National Park - Flamingo WWTP Improvements
Item: Alternative 4
Atlernative 1 w/separate anoxic box and new clarifier

Project No: CONPS67
Sheet 1 of
By: WLV Ckd:

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
Rehabilitation				
Demolition	1	LS	$25,000	$25,000
Replace Bridging	300	SF	$25	$7,500
Replace Stairs	1	LS	$3,500	$3,500
Concrete Repair	1	LS	$25,000	$25,000
Replace 3 hp submersible pump	5	EA	$3,800	$19,000
Subotal				**$80,000**
Separate Anoxic Box				
Mixers	2	EA	$2,500	$5,000
50,000-gallon steel tank & appurtenances	1	EA	$60,000	$60,000
Concrete Slab	35	CY	$400	$14,000
Subtotal				**$79,000**
Sludge Holding Tank				
Concrete Walls	11	CY	$500	$5,500
Telescoping Valve 6"	2	EA	$2,400	$4,800
Diaphragm Pump 6"	2	EA	$6,000	$12,000
Fine Bubble Diffuser	50	LF	$20	$1,000
Subtotal				**$23,300**
Secondary Clarifier				
Concrete Slab	50	CY	$400	$20,000
Concrete Walls	25	CY	$500	$12,500
Clarifier Mechanism	1	LS	$50,000	$50,000
Collection troughs, weirs, bridge, etc.	1	LS	$15,000	$15,000
RAS/WAS Pump Station	1	LS	$14,000	$14,000
Scum Pump Station	1	LS	$14,000	$14,000
Subtotal				**$125,500**
SUBTOTAL				**$307,800**
Sitework	5%			$15,390
Electrical and Instrumentation	15%			$46,170
Piping and Valving	10%			$30,780
Special Conditions	5%			$15,390
Remoteness Factor	20%			$61,560
SUBTOTAL				**$477,090**

Overhead and Profit	20%	$95,418
Contingency	10%	$47,709
TOTAL		***$630,000***

Richard P. Arber Associates, Inc.
Consulting Engineering and Project Management

OPINION OF PROBABLE CONSTRUCTION COST

National Park Service
Everglades National Park - Flamingo WWTP Improvements
Item:

Alternative 5
New Plant - w/chemical P removal and filtration & demo existing

Project No: CONPS67
Sheet 1 of
By: WLV Ckd:
Date:
10/4/00 Date:

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
Concrete Demolition	300	CY	$150	$45,000
Steel Demolition	1	LS	$25,000	$25,000
				$70,000
Equipment Package	1	LS	$280,000	$280,000
Concrete Slab	100	CY	$400	$40,000
				$320,000
Package Filter System	1	LS	$75,000	$75,000
Concrete Slab	10	CY	$400	$4,000
				$79,000
20,000-gallon steel tank & appurtenances	1	EA	$50,000	$50,000
Concrete Slab	15	CY	$400	$6,000
				$56,000
				$525,000
Sitework	5%			$26,250
Electrical and Instrumentation	15%			$78,750
Piping and Valving	10%			$52,500
Special Conditions	5%			$26,250
Remoteness Factor	20%			$105,000
				$813,750
Overhead and Profit	20%			$162,750
Contingency	10%			$81,375
				$1,060,000

Richard P. Arber Associates, Inc. **OPINION OF PROBABLE**
Consulting Engineering and Project Management **CONSTRUCTION COST**

National Park Service
Everglades National Park - Flamingo WWTP Improvements
Item:
Alternative 6
New Plant - w/chemical P removal and filtration & mothball existing

Project No: CONPS67
Sheet 1 of
By: WLV Ckd:
Date: 10/4/00

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
Demolition				
Concrete Demolition	0	CY	$150	$0
Steel Demolition	0	LS	$25,000	$0
Subotal				**$0**
New WWTP				
Equipment Package	1	LS	$280,000	$280,000
Concrete Slab	100	CY	$400	$40,000
Subtotal				**$320,000**
Effluent Filtration				
Package Filter System	1	LS	$75,000	$75,000
Concrete Slab	10	CY	$400	$4,000
Subtotal				**$79,000**
Effluent Disinfection				
20,000-gallon steel tank & appurtenances	1	EA	$50,000	$50,000
Concrete Slab	15	CY	$400	$6,000
Subtotal				**$56,000**
SUBTOTAL				**$455,000**
Sitework	5%			$22,750
Electrical and Instrumentation	15%			$68,250
Piping and Valving	10%			$45,500
Special Conditions	5%			$22,750
Remoteness Factor	20%			$91,000
SUBTOTAL				**$705,250**
Overhead and Profit	20%			$141,050
Contingency	10%			$70,525
TOTAL				***$920,000***

Richard P. Arber Associates, Inc.
Consulting Engineering and Project Management

OPINION OF PROBABLE CONSTRUCTION COST
Project No: CONPS67
Sheet 1 of
By: WLV
Date: 10/4/00

National Park Service
Everglades National Park - Flamingo WWTP Improvements
Item:
New Plant - w/chemical P removal and filtration w/building and chem feed

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
Misc. Facilities				
Buidling	1	LS	$390,000	$390,000
Chem. Feed	1	LS	$15,000	$15,000
Subotal				**$405,000**
New WWTP				
Equipment Package	1	LS	$280,000	$280,000
Concrete Slab	100	CY	$400	$40,000
Subtotal				**$320,000**
Effluent Filtration				
Package Filter System	1	LS	$75,000	$75,000
Concrete Slab	10	CY	$400	$4,000
Subtotal				**$79,000**
Effluent Disinfection				
20,000-gallon steel tank & appurtenances	1	EA	$50,000	$50,000
Concrete Slab	15	CY	$400	$6,000
Subtotal				**$56,000**
SUBTOTAL				**$860,000**
Sitework	5%			$43,000
Electrical and Instrumentation	15%			$129,000
Piping and Valving	10%			$86,000
Special Conditions	5%			$43,000
Remoteness Factor	20%			$172,000
SUBTOTAL				**$1,333,000**
Overhead and Profit	20%			$266,600
Contingency	10%			$133,300
TOTAL				***$1,740,000***

APPENDIX J

EASTERN INDIGO SNAKE CONSERVATION AND PROTECTION PLAN

Eastern Indigo Snake Conservation and Protection Plan

Everglades National Park ("park") will implement an Eastern indigo snake conservation and protection plan for the entire length of the proposed project corridor that traverses suitable Eastern indigo snake habitat. This plan is the park's proposal to minimize adverse effects from implementation of the proposed project to the Eastern indigo snake. Components of the plan are listed below:

1. The park will minimize the potential of heavy equipment injuring or killing an Eastern indigo snake by incorporating the Standard Protection Measures for the Eastern Indigo Snake in the project design (see below).

2. The park will obtain all appropriate handling and relocation permits for work with the Eastern indigo snake. Copies of all permits will be forwarded to the Service's South Florida Ecological Services Office, Vero Beach, Florida.

3. To further minimize potential adverse effects to the Eastern indigo snake, the park will implement a relocation plan that includes the following:

    a. staked silt fence will be installed along the entire project area that supports either tortoise or wetland habitats to limit emigration of Eastern indigo snakes onto the project limits. The silt fence will be buried in the ground and extend up 2 feet;

    b. immediately prior to clearing and grubbing activities, all potentially suitable denning areas (e.g. gopher tortoise burrows [active, inactive, and abandoned], rat holes, tree stumps) within the project area will be scoped for the presence of Eastern indigo snakes. If an Eastern indigo snake is not discovered, the denning area will be collapsed to prevent re-entry by snakes;

    c. all observed Eastern Indigo snakes will be captured, transported and released immediately outside of the silt fence project area boundary. All relocated individuals will be released on the side of the project area that has the greatest amount of remaining indigo snake habitat;

    d. during clearing and grubbing activities, the project area fence will be walked each morning. If an Eastern Indigo snake is discovered, it will be captured and relocated using the same protocol as 2.c above;

    e. if clearing and grubbing activities occur in discrete sections, this process will be repeated in each applicable section;

    f. only individuals with the appropriate handling permits will be authorized to capture and relocate Eastern indigo snakes;

    g. all captured Eastern indigo snakes will be released as soon as possible in appropriate habitat; and

    h. upon completion of all surveys and relocations, a report detailing the results of all Eastern indigo snake surveys and relocations will be submitted to the Service.

To implement the above Eastern indigo snake protective measures, the park will comply with the following Standard Protection Measures for the Eastern Indigo Snake:

1. An Eastern indigo snake protection/education plan shall be developed by the park for all construction personnel to follow. The plan shall be provided to the Service for review and approval at least 30 days prior to any clearing activities. The education materials for the plan may consist of a combination of posters, videos, pamphlets, and lectures (e.g., an observer trained to identify Eastern indigo snakes could use the protection/education plan to instruct construction personnel before clearing activities occur).

   Information signs should be posted throughout the construction site and contain the following information:

   a. a description of the Eastern indigo snake, its habits, and protection under Federal Law;

   b. instructions not to injure, harm, harass, or kill the species;

   c. directions to cease clearing activities and allow the Eastern indigo snake sufficient time to move away from the site on its own before resuming clearing; and

   d. telephone numbers of pertinent agencies to be contacted if a dead Eastern indigo snake is encountered. The dead specimen should be thoroughly soaked in water, then frozen.

2. Only an individual who has been either authorized by a section 10(a)(1)(A) permit issued by the Service, or authorized by the FWC for such activities, is permitted to come into contact with or relocate and Eastern indigo snake.

3. If necessary, Eastern indigo snakes shall be held in captivity only long enough to transport them to the release site; at no time shall two snakes be dept in the same container during transportation.

4. An Eastern indigo snake monitoring report must be submitted to the appropriate Service Florida Field Office within 60 days of the conclusion of clearing phases. The report should be submitted when any Eastern indigo snakes are observed or relocated. The report should contain the following information:

   a. results of the tortoise burrow and field surveys;
   b. any sightings of Eastern indigo snakes;
   c. summaries of any relocation activities for the project (e.g., locations os where and when they were found and relocate); and
   d. other obligations required by FWC, as stipulated in the permit.